

Attachment A: Flow Frequency Memorandum

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Piedmont Regional Office
4949-A Cox Road Glen Allen, Virginia 23060

SUBJECT: Flow Frequency Determination / 303(d) status
Emporia WWTP – VA0020346

TO: Janine Howard

FROM: Jennifer Palmore, P.G.

DATE: October 23, 2011

COPIES: Modeling File

The Emporia Wastewater Treatment Plant discharges to the Meherrin River in Emporia, VA. The discharge is located at rivermile 5AMHN050.90. Stream flow frequencies are required for use by the permit writer in developing effluent limitations for the VPDES permit.

The VDEQ has operated a continuous record gage on the Meherrin River at Emporia, VA (#02052000) since 1951. The gage is located at the Route 301 bridge, approximately 1.3 mile upstream of the discharge point. The flow at the gage is regulated by a hydropower plant located 0.8 mile upstream; therefore only flow frequencies at the gage during the regulated period of record after April 1986 were used. Due to the proximity of the gage and the discharge, the flows can be assumed to be equal.

This analysis does not address any additional withdrawals, discharges, or springs influencing the flow between the measurement site and discharge point.

Meherrin River at Emporia, VA (#02052000)

Drainage Area = 747 mi²

Statistical period = 1986-2003

High Flow Months: January to April

1Q30 = 4.1 cfs	High Flow 1Q10 = 99 cfs
1Q10 = 7.6 cfs	High Flow 7Q10 = 155 cfs
7Q10 = 18 cfs	High Flow 30Q10 = 254 cfs
30Q10 = 28 cfs	HM = 144 cfs
30Q5 = 41 cfs	

During the 2010 305(b)/303(d) Water Quality Assessment, this segment of the Meherrin River was considered a Category 5A water ("A Water Quality Standard is not attained. The water is impaired or threatened for one or more designated uses by a pollutant(s) and requires a TMDL (303d list).") The applicable fact sheets are attached. The river is impaired of the Fish Consumption Use due to PCBs and mercury in fish tissue. Arsenic in fish tissue was also above its screening limit and is considered an observed effect. The Aquatic Life Use is impaired due to low dissolved oxygen. The Recreation- and Wildlife Uses are fully supporting. The discharge is not currently included in any TMDL.

Water quality data from monitoring station 5AMHN052.34 is attached. The station is located on the Meherrin River at the Rt. 301 bridge, which is approximately 1.3 mile upstream of the discharge and is co-located with the flow gage.

The receiving stream is considered a Tier 1 water. The river experiences periods of low dissolved oxygen and is currently impaired for the Aquatic Life Use. Antidegradation was not applied during the 1988 modeling effort.

If you have any questions, please do not hesitate to ask.

2010 Fact Sheets for 303(d) Waters

RIVER BASIN: Chowan River and Dismal Swamp Basins **HYDROLOGIC UNIT:** 03010204

STREAM NAME: Meherrin River

TMDL ID: K09R-01-DO **2010 IMPAIRED AREA ID:** VAP-K09R-01

ASSESSMENT CATEGORY: 5A **TMDL DUE DATE:** 2020

IMPAIRED SIZE: 27.05 - Miles **Watershed:** VAP-K09R

INITIAL LISTING: 2008

UPSTREAM LIMIT: Emporia Reservoir Dam

DOWNSTREAM LIMIT: Route 730 bridge

The Meherrin River from the Emporia Reservoir Dam to the Route 730 bridge

CLEAN WATER ACT GOAL AND USE SUPPORT:

Aquatic Life Use - Not Supporting

IMPAIRMENT: Dissolved Oxygen

The Meherrin River was initially listed during the 1998 cycle as fully supporting but threatened of the Aquatic Life use support goal and was downgraded to impaired during the 2004 cycle due to a dissolved oxygen exceedance rate of 7/49 at the Route 602 bridge (5AMHN052.34). During the 2006 cycle, the exceedance rate fell to 2/37, therefore the segment was delisted.

However, during the 2008 cycle, the exceedance rate was 5/38, therefore the segment was relisted. The TMDL is due in 2020. The exceedance rate was 4/34 during the 2010 cycle.

IMPAIRMENT SOURCE: Hypolimnetic Release

The source of the low dissolved oxygen is considered unknown, but is believed to be caused by the release of hypolimnetic waters from the Emporia Reservoir dam.

RECOMMENDATION: UAA

2010 Fact Sheets for 303(d) Waters

RIVER BASIN:	Chowan River and Dismal Swamp Basins	HYDROLOGIC UNIT:	03010204
STREAM NAME:	Meherrin River, Fontaine Creek, Mill Swamp		
TMDL ID:	K09R-01-HG	2010 IMPAIRED AREA ID:	VAP-K09R-01
ASSESSMENT CATEGORY:	5A	TMDL DUE DATE:	2022
IMPAIRED SIZE:	60.95 - Miles	Watershed:	VAP-K09R
INITIAL LISTING:	2010		
UPSTREAM LIMIT:	Emporia Reservoir Dam		
DOWNSTREAM LIMIT:	State Line		

CLEAN WATER ACT GOAL AND USE SUPPORT:

Fish Consumption Use - Not Supporting

IMPAIRMENT: Mercury

During the 2010 cycle, the Virginia Department of Health issued a fish consumption advisory due to mercury in bowfin and largemouth bass. The advisory includes the Meherrin River from Emporia Reservoir dam to the state line, including the tributaries Fontaine Creek and Mill Swamp up to the I-95 bridge crossings. The segment will be considered impaired of the Fish Consumption Use. The advisory was based on mercury exceedances at DEQ monitoring stations 5AMHN026.54, 5AMHN051.43, 5AFON006.07, and 5AMLS001.42.

IMPAIRMENT SOURCE: Unknown, Atmospheric Deposition

The source of the mercury is unknown, but atmospheric conditions are suspected.

RECOMMENDATION: Problem Characterization

2010 Fact Sheets for 303(d) Waters

RIVER BASIN:	Chowan River and Dismal Swamp Basins	HYDROLOGIC UNIT:	03010204
STREAM NAME:	Meherrin River		
TMDL ID:	K09R-01-PCB	2010 IMPAIRED AREA ID:	VAP-K09R-01
ASSESSMENT CATEGORY:	5A	TMDL DUE DATE:	2016
IMPAIRED SIZE:	27.05 - Miles	Watershed:	VAP-K09R
INITIAL LISTING:	2004		
UPSTREAM LIMIT:	Emporia Reservoir Dam		
DOWNSTREAM LIMIT:	Route 730 bridge		

The Meherrin River from the Emporia Reservoir Dam to the Route 730 bridge

CLEAN WATER ACT GOAL AND USE SUPPORT:

Fish Consumption Use - Not Supporting

IMPAIRMENT: Fish Tissue - PCBs, VDH Fish Consumption Advisory

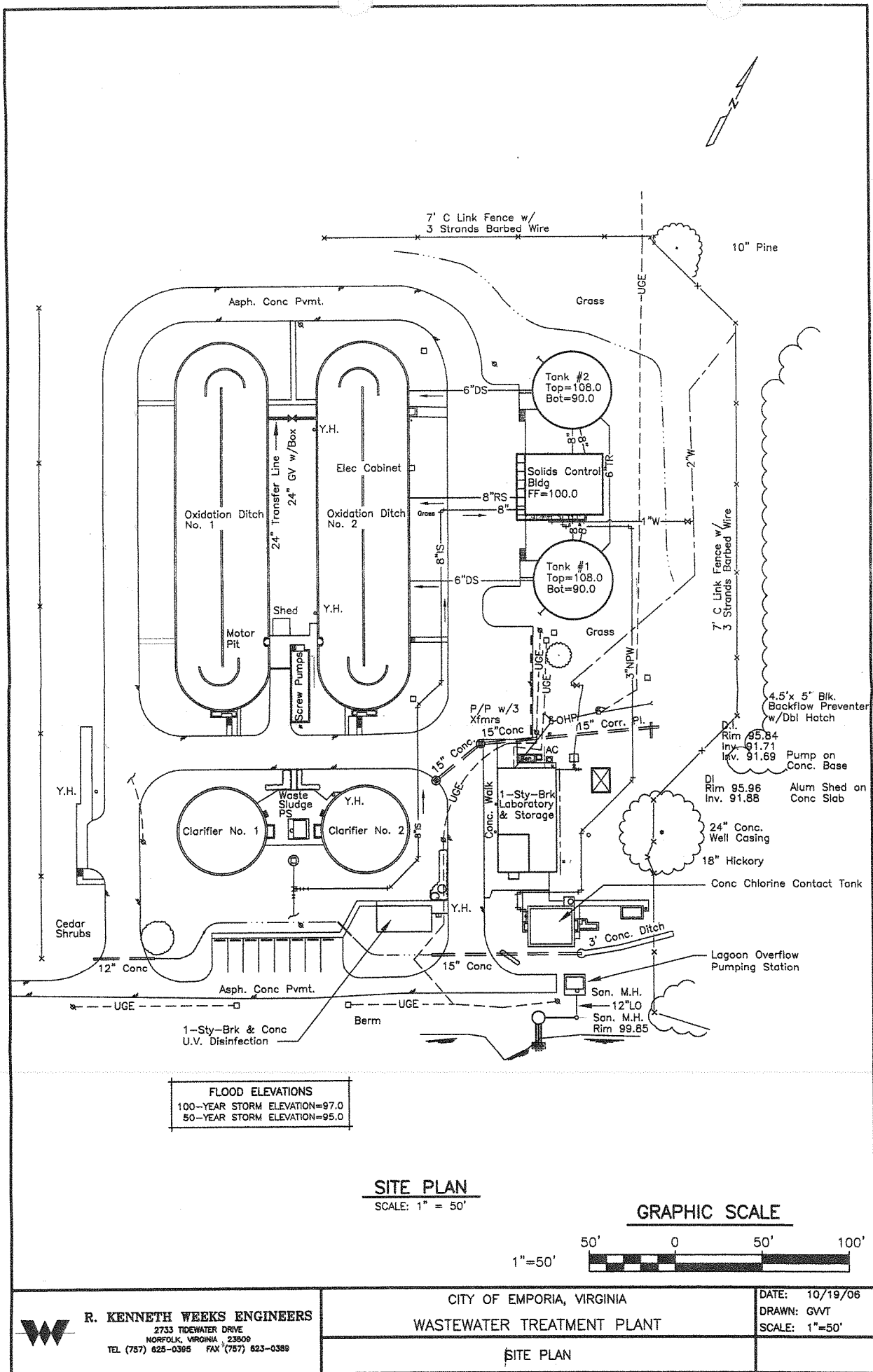
During the 2004 cycle, the Meherrin River from the Emporia Reservoir dam downstream approximately 5 miles was assessed as not supporting the Fish Consumption Use due to PCBs in fish tissue in two samples at station 5AMHN051.43. During the 2006 cycle, VDH issued a fish consumption advisory for PCBs from the Emporia dam to the Route 730 bridge. The segment was extended to match the advisory. The TMDL due date is 2016.

IMPAIRMENT SOURCE: Unknown

The source(s) of the fish tissue contaminants are considered unknown.

RECOMMENDATION: Problem Characterization

Attachment B: Plant Flow Diagram



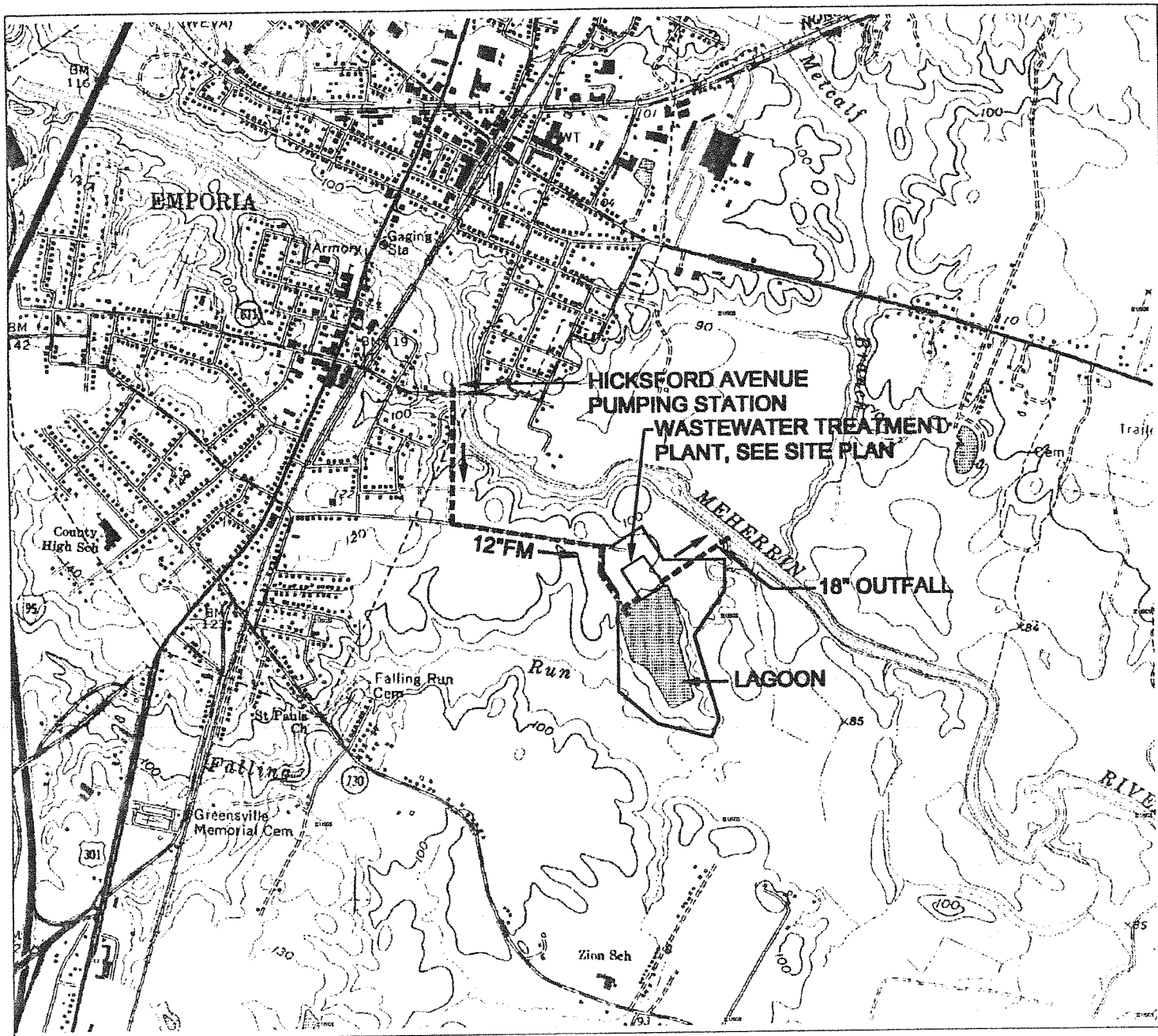
R. KENNETH WEEKS ENGINEERS
 2733 TIDEWATER DRIVE
 NORFOLK, VIRGINIA 23508
 TEL (757) 625-0395 FAX (757) 623-0399

CITY OF EMPORIA, VIRGINIA
 WASTEWATER TREATMENT PLANT

DATE: 10/19/06
 DRAWN: GWT
 SCALE: 1"=50'

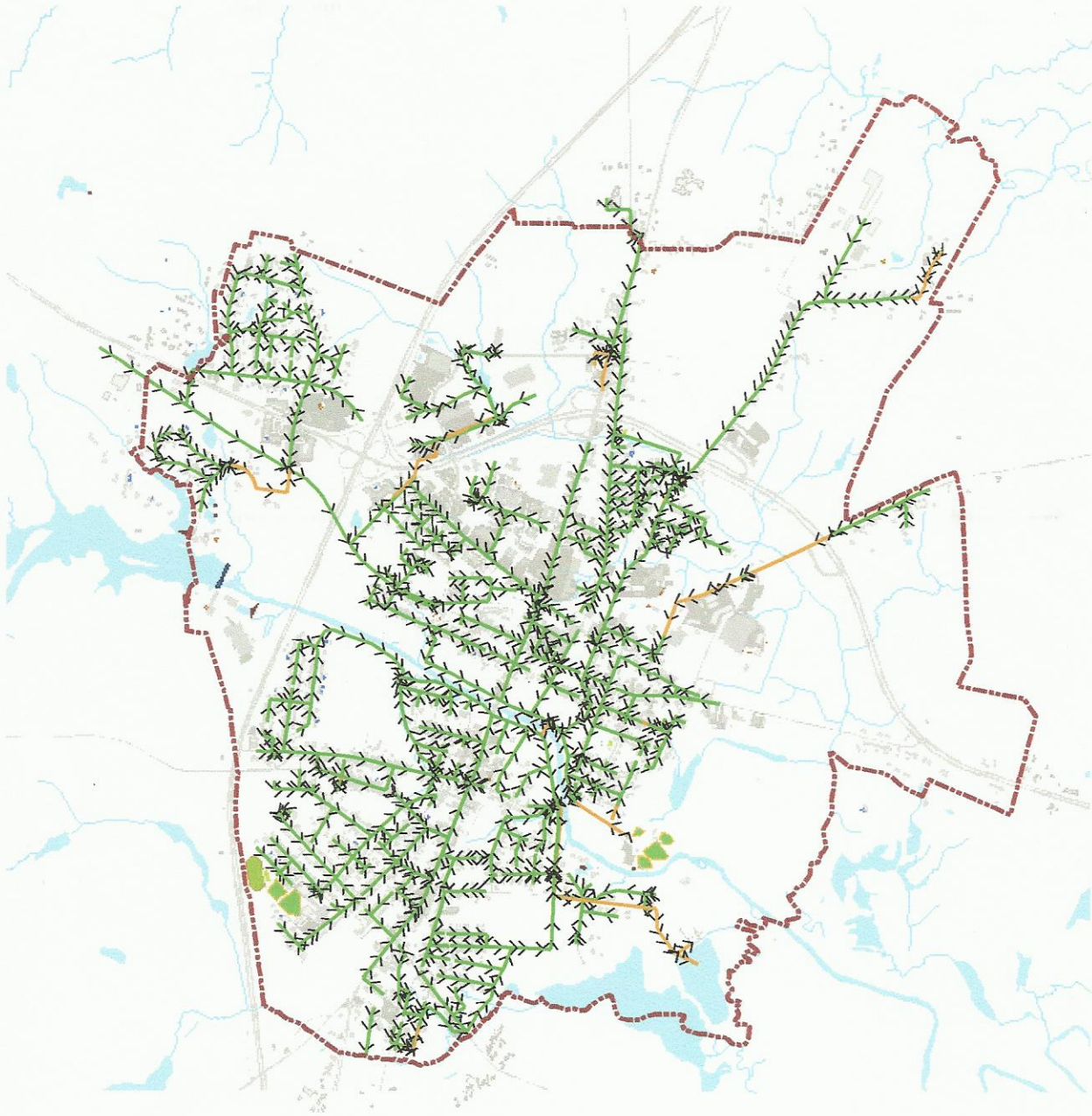
SITE PLAN

**Attachment C: Topographic Map (Emporia Quadrangle 8A)
and Aerial Image**



TOPOGRAPHIC MAP
SCALE: 1" = 2000'
USGS EMPORIA QUADRANGLE

Emporia City
Limits (red
dashed line)



Map Export













Legend

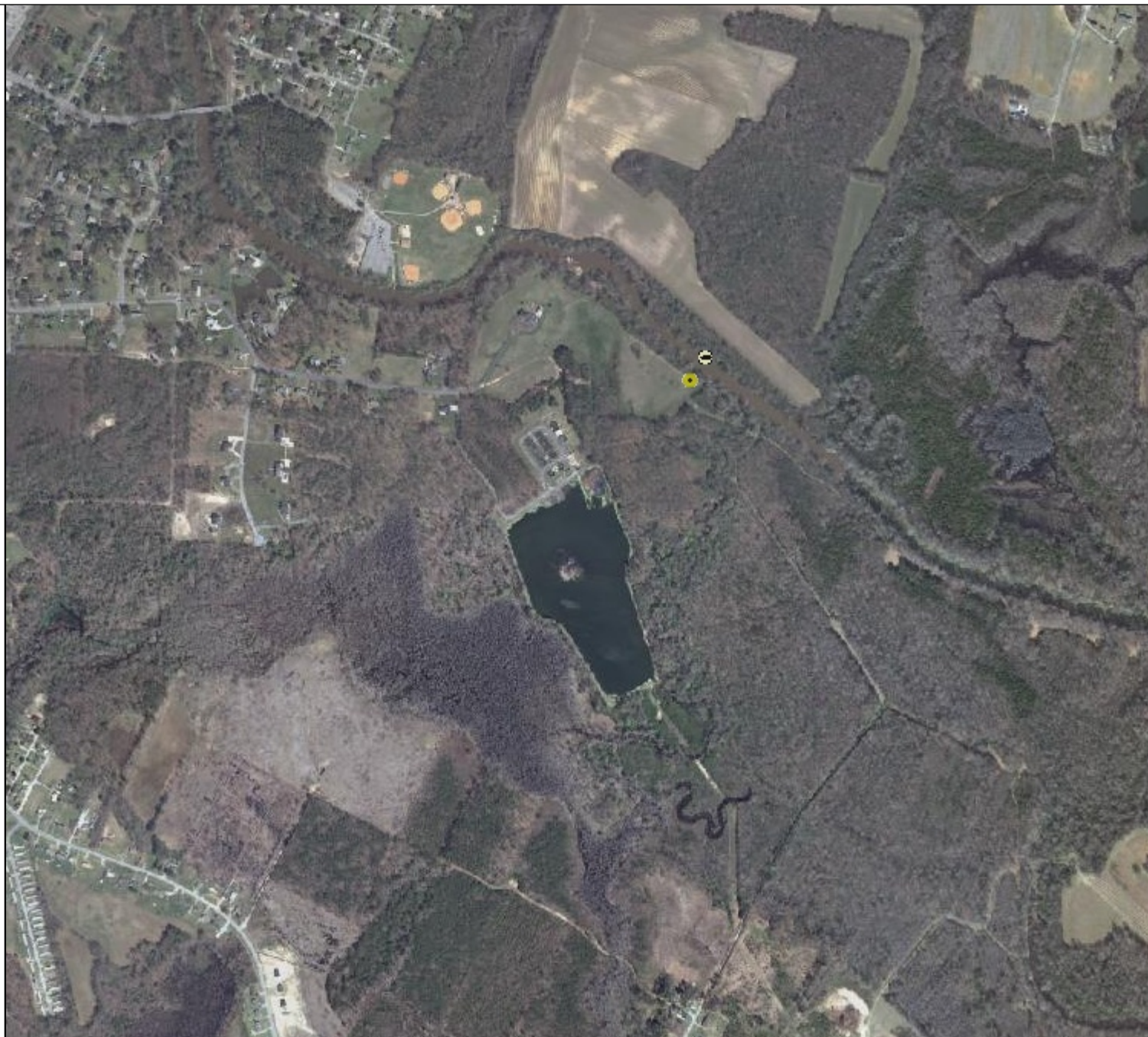
DEQ Offices (2009)

-  DEQ Central Office
-  South West Regional Office
-  Blue Ridge Regional Office
-  Northern Regional Office
-  Piedmont Regional Office
-  Tidewater Regional Office
-  Valley Regional Office

VPDES (2004)

2010 Monitoring Stations

-  Ambient
-  Ambient/Biological
-  Ambient/Biological/Fish Tissue
-  Ambient/Fish Tissue
-  Biological
-  Biological/Fish Tissue
-  Citizen Monitoring
-  Federal
-  Fish Tissue
-  Trend
-  VDH-BEACH
-  DEQ Regions (2009)



Feet

0 200 400 600 800
Map Scale: 1:12,000



**Attachment D: Site Inspection Report and Compliance
Inspection Report**

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY

Piedmont Regional Office

4949-A Cox Rd Glen Allen, VA 23060

(804) 527-5020

SUBJECT: Site Visit- VA0020346- Emporia Wastewater Treatment Plant Site Visit

TO: File

FROM: Janine Howard, PRO Permit Writer

DATE: 17 November 2011

On November 9, 2011 Meredith Williams (DEQ Water Compliance), Megan Hayes (DEQ Air Compliance), and I met with Larry Epps (WWTP Superintendent) and Melvin Prince (WWTP Operator) at the Emporia WWTP. The facility is located at 500 Tall Oaks Drive in Emporia, VA. We arrived at approximately 9:40am and departed the plant at 10:50am.

The purpose of the visit was a combined compliance inspection and routine site visit made as part of the reissuance process. The facility received a Warning Letter for the month of September for TSS and *E. coli* permit limitation exceedances and it is expected that a similar warning letter will be issued for the month of October, likely resulting in a referral to Enforcement staff. A dark, ashy influent is blamed for the limitation exceedances and is thought to be sourced to the Georgia Pacific plywood plant in Emporia. The wastewater treatment plant first began experiencing an upset in the middle of September, and continues to struggle to date. Georgia Pacific and the Emporia WWTP staff are working together to come to a solution and reduce the dark influent. The ashy influent is near-black in color and the sediment particles are extremely fine. The operators have implemented a temporary polymer feed system to aid settling. The operators tried two types of polymer, the first of which did not provide enough settling to lower the TSS in the final effluent or keep the ultraviolet (UV) system clear of obstruction. The second polymer, "C-338 Clarifloc (R) solution polymer" successfully prompted enough flocculation and settling to allow the plant to meet its TSS limitation. Prior to the polymer addition, the dark, ashy substance coated the ultraviolet bulbs in the disinfection system, preventing transmittance and an adequate kill. This in turn resulted in bacteria counts of over 2,000 N/cmL at the height of the upset. Refer to the Compliance Inspection report (attached) by Meredith Williams for further details regarding the upset and compliance issues.

We toured the facility beginning with the headworks. The influent flows first to a mechanical rotating screen and at the time of the site visit the influent remained dark in color (Figure 1). Larry indicated that the influent is typically light grey as opposed to near black. Following screening, the wastewater flows through a grit channel which allows larger solids to settle. A grit collector runs on a timer for ten (10) minutes every hour and sweeps the grit channel, keeping it clear of obstruction (Figure 2). The grit is funneled to a dumpster for disposal. A caustic tank is located at the headworks and may be utilized to adjust the pH of the wastewater. The feed is automatically controlled via a pH probe. Larry indicated that they have not had to feed any caustic for pH adjustment in a few months. The caustic tank is surrounded by a large containment wall to prevent any potential spill or leak from reaching state waters (Figure 3). Following primary screening, the wastewater flows to a series of oxidation ditches. The first is anoxic, with a dissolved oxygen concentration of 0.1- 0.2 mg/L. The second oxidation ditch is maintained with a dissolved oxygen concentration of 1.5- 3.0 mg/L (Figure 4). A cylindrical set of rotating disks are used to aerate the basins (Figure 5 and 6).

Return sludge from the clarifiers is directed to the first oxidation ditch via a set of screw pumps (Figure 7). Larry stated that the operators rarely utilize both pumps, as one is adequate to handle the typical flow. The plant has two clarifiers and the flow is evenly split between the two. Each clarifier is equipped with a brush arm which continually cleans the clarifiers (Figure 8). We viewed the Cannibal "solids reduction system" (Figure 9), which continues to fall short of expectations. The system was installed in 2005 and it was hoped that it would eliminate waste sludge. However, some sludge is still generated on site and the facility continues to dispose of a small amount of sludge in the 22 acre sludge lagoon out of necessity. The plant is still working with the manufacturer with the aim of fixing the Cannibal system so that it works as designed. The sludge lagoon is occasionally utilized as an equalization basin during period of high precipitation. Most recently, the lagoon was used in this manner during Hurricane Irene.

In 2001, the plant installed a UV disinfection system to replace the older gas chlorination system. The UV system consisted of two tracts (UV-A and UV-B), each of which contains four bulbs (Figure 10). The wastewater flow is evenly split between UV-A and UV-B. Under usual operating circumstances, the bulbs provide an adequate kill on power level 1 (out of 3) and are replaced every 8,000 hours or approximately once per year. Due to the plant upset and increased turbidity of the wastewater (even with polymer addition), Larry is presently running the UV system on power level 3 to provide an adequate kill and maintain compliance with the permit *E. coli* limitation. Continual use of power level 3 will half the life of the UV bulbs. Following UV disinfection the wastewater flows through the old chlorine contact tank (Figure 11), to a Parshall flume where the flow is measured by an ultra-sonic sensor, and down a step aerator (Figure 12) to the outfall. The final effluent appeared fairly clear and due to continual polymer feeding, Larry expects to meet the TSS and *E. coli* permit limitations for the month of November.

The site itself was well kept and the grounds were immaculate. All chemicals are stored under cover or with containment, and do not pose a storm water contamination concern.



Figure 1. Influent and rotating screen



Figure 2. Grit Channel and grit collector



Figure 3. Caustic tank and containment wall



Figure 4. Second oxidation ditch (the first oxidation ditch is visible in the background)



Figure 5. Rotating disks



Figure 6. Inactive rotating disks



Figure 7. Return sludge screw pump



Figure 8. Clarifier brushes



Figure 9. Cannibal system

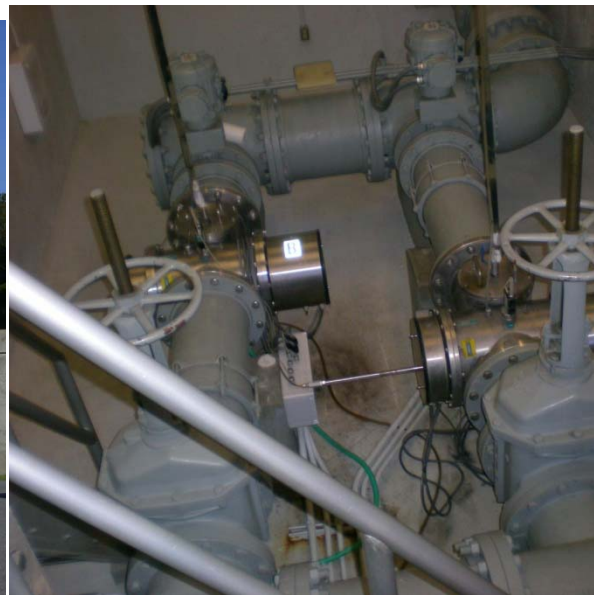


Figure 10. UV disinfection system

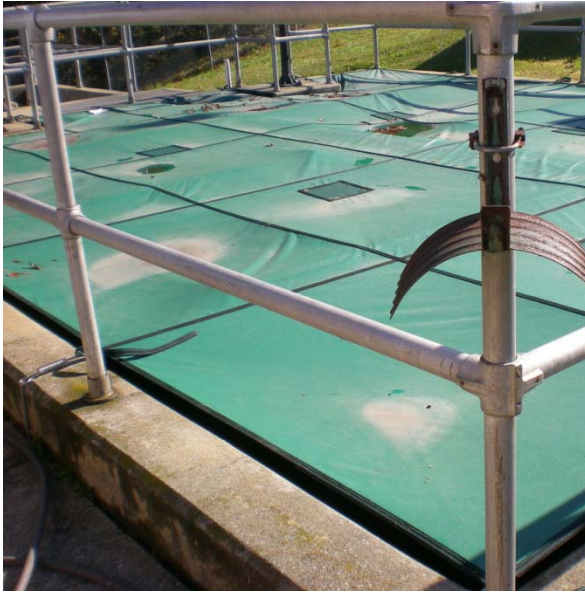


Figure 11. Covered chlorine contact tank (flow-through, no treatment)



Figure 12. Final effluent and step aerator

Virginia Department of Environmental Quality

COMPLIANCE INSPECTION REPORT

FACILITY NAME: <u>City of Emporia WWTP</u>		INSPECTION DATE: <u>11/9/11</u>	
PERMIT No.: <u>VA0020346</u>		INSPECTOR: <u>Meredith Williams</u>	
TYPE OF FACILITY:		REPORT DATE: <u>11/10/11</u>	
<input checked="" type="checkbox"/> Municipal <input checked="" type="checkbox"/> Major <input type="checkbox"/> Industrial <input type="checkbox"/> Minor <input type="checkbox"/> Federal <input type="checkbox"/> Small Minor <input type="checkbox"/> HP <input type="checkbox"/> LP		TIME OF INSPECTION:	<div style="display: flex; justify-content: space-between;"> <u>0937</u> Arrival <u>1110</u> Departure </div>
		TOTAL TIME SPENT (including prep & travel)	<u>12 hours</u>
PHOTOGRAPHS: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		UNANNOUNCED INSPECTION? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
REVIEWED BY / Date:			
PRESENT DURING INSPECTION: Larry Epps, Melvin Prince-Plant Operators; Janine Howard, Megan Hayes-DEQ Staff			

<u>WL # W2011-10-P-1004:</u> <u>Paraphrase Noncompliance issues</u>	<u>Reported Cause of Noncompliance:</u>	<u>Corrective Action Taken:</u>
<ol style="list-style-type: none"> 1. The September 2011 DMR reported a TSS average loading of 369 kg/day, versus a permit allowable average loading of 107 kg/day. 2. The September 2011 DMR reported a maximum loading of 427 kg/day, versus a permit allowable maximum loading of 255 kg/day. 3. The September 2011 DMR reported a TSS average concentration of 144.5 mg/L, versus a permit allowable average concentration of 30 mg/L. 4. The September 2011 DMR reported an E. coli average concentration of 140 #C/mL, versus a permit allowable average concentration of 126 #C/mL. 	<p>1-4. The cause of the noncompliance has been associated to a plant upset that was reportedly caused by an unusual industrial discharge to the WWTP. The influent to the WWTP was black in color and very high in solids, which caused the UV disinfection system to become ineffective. The unusual discharge caused the bulbs and sleeves in the UV system to become "burned" and blackened.</p>	<p>1-4. Utility personnel located the manhole at which the unusual discharge was entering the sewer system. Polymer is being added to the WWTP to improve the clarity of the wastewater which will allow the UV system to function properly. The UV system was fully cleaned and rebuilt for optimal performance. The addition of polymer is temporary until the black influent has ceased.</p>

INSPECTION OVERVIEW AND CONDITION OF TREATMENT UNITS

<p>Treatment units at the WWTP consist of: Screening, Grit Removal, Extended Aeration (oxidation ditch), Clarification, UV disinfection and post aeration. Because the Cannibal system has not performed as expected, the majority of the sludge is disposed of in the sludge lagoon.</p> <p>At the time of this inspection, the influent to the WWTP was black in color with a large amount of suspended solids. The solids had the appearance of suspended ash. The operators reported that this type of unusual influent has been the cause of the problems at the WWTP. The operators are adding polymer to the oxidation ditch to improve the settling characteristics of the wastewater. The final effluent appeared clear at the time of inspection. The inspector noted that black soot was present on the step cascade walls and autosampler. Operators indicated this soot resulted from the mist of the effluent off the step cascade.</p> <p>Following the site visit at the WWTP, the Operators accompanied DEQ staff to the manhole (located on East Atlantic Street) where the unusual discharge was entering the collection system. This manhole is the location in which Georgia Pacific (GP) reportedly discharges to the POTW. DEQ staff observed the black wastewater discharge into the collection system. The discharge occurred approximately every 4 minutes and lasted approximately 20 seconds. This cycle repeated while DEQ staff and Operators were present. Operators stated they had been in communication with GP and this discharge did appear to be ash wash water from the scrubber system. The Operators and GP personnel were scheduled to meet on the day following this inspection to discuss the issue.</p> <p>DEQ inspectors visited GP (VA0006483) following the site visit at the Emporia WWTP to conduct a multi-media Recon Inspection of the scrubber system. More details regarding the visit can be found in the Memo written by M. Hayes, DEQ Air Inspector (A copy of the Memo has been placed in ECM under permit number VA0006483).</p>

VA DEQ Compliance Inspection Report

Permit #	VA0020346
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***EFFLUENT FIELD DATA: *Data analyzed on 11/8/11 by WWTP Staff.**

Flow .714 MGD	Dissolved Oxygen 9.4 mg/L	TRC (Contact Tank) N/A mg/L
pH 6.89 S.U.	Temperature 19.1 °C	TRC (Final Effluent) N/A mg/L
Was a Sampling Inspection conducted? <input type="checkbox"/> Yes (see Sampling Inspection Report) <input checked="" type="checkbox"/> No		

CONDITION OF OUTFALL AND EFFLUENT CHARACTERISTICS:

1. Type of outfall: <input checked="" type="checkbox"/> Shore based <input type="checkbox"/> Submerged	Diffuser? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
2. Are the outfall and supporting structures in good condition?	<input type="checkbox"/> Yes <input type="checkbox"/> No
3. Final Effluent (evidence of following problems):	<input type="checkbox"/> Sludge bar <input type="checkbox"/> Grease <input type="checkbox"/> Turbid effluent <input type="checkbox"/> Visible foam <input type="checkbox"/> Unusual color <input type="checkbox"/> Oil sheen
4. Is there a visible effluent plume in the receiving stream?	<input type="checkbox"/> Yes <input type="checkbox"/> No
5. Receiving stream: <input type="checkbox"/> No observed problems <input type="checkbox"/> Indication of problems (explain below)	
<u>Comments: The final effluent appeared clear. DEQ staff did not observe the receiving stream on the day of inspection due to extreme muddy conditions. Melvin Prince stated that he viewed the final outfall/receiving stream within the past week and did not observe any black material.</u>	

REQUEST for ACTION:

1. None.

NOTES and COMMENTS:

1. The plant operators are working hard to meet permit limits and should be commended for their efforts in running the plant under these unusual conditions. 2. Continue efforts in working with industrial sewer users to determine the source of the unusual influent. 3. Continue to keep DEQ informed of the status of the treatment plant and any operational changes that may be made (i.e. use of chlorine/dechlor).

VA DEQ Compliance Inspection Report

Facility No. VA0020346
Digital Photographs Taken 11/9/11



Photograph 1: Polymer addition to oxidation ditch



Photograph 2: Screening



Photograph 3: Influent; note unusual black color



Photograph 4: Grit removal



Photograph 5: Caustic for pH adjustment (if necessary) at headworks



Photograph 6: Oxidation ditch (2 of 2)

VA DEQ Compliance Inspection Report

Facility No. VA0020346
Digital Photographs Taken 11/9/11



Photograph 7: Unusual black wastewater in oxidation ditch; suspended solids have a black, metallic appearance



Photograph 8: Oxidation ditch (1 of 2)



Photograph 9: Return sludge from clarifier to oxidation ditch



Photograph 10: 1 of 2 Clarifiers



Photograph 11: Effluent weirs on clarifier; effluent appears fairly clear; some black material has settled in effluent trough



Photograph 12: 2 of 2 Clarifiers; automatic cleaning brushes have been pulled up in order to not disturb black material that has settled

VA DEQ Compliance Inspection Report

Facility No. VA0020346
Digital Photographs Taken 11/9/11



Photograph 13: Enclosed UV system; 8 bulbs in each unit; both units currently operating to ensure proper disinfection



Photograph 14: Old CCT; flow continues to pass through this tank



Photograph 15: Effluent weir and flow meter; meter last calibrated 6/30/11



Photograph 16: Post aeration; effluent fairly clear



Photograph 17: Screening system that precedes the Cannibal system



Photograph 18: Sludge holding tank

VA DEQ Compliance Inspection Report

Facility No. VA0020346
Digital Photographs Taken 11/9/11



Photograph 19: Manhole along East Atlantic St.; note black soot material around top edge of manhole



Photograph 20: Discharge from Georgia Pacific

Attachment E: Ambient Data (Station 5AMHN052.34)

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical
5AMHN052.34	2/26/1968	S	0.3	3.33	7.5		11.5	
5AMHN052.34	4/30/1968	S	0.3	16.67	8		7.5	
5AMHN052.34	7/28/1968	S	0.3	27.78	7.3		7.2	
5AMHN052.34	8/1/1968	S	0.3	32.22	6		5.7	
5AMHN052.34	8/29/1968	S	0.3	25	7		5	
5AMHN052.34	10/1/1968	S	0.3	21.11	6.5		1.5	
5AMHN052.34	1/23/1969	S	0.3	4.44	7.3		13.19	
5AMHN052.34	4/20/1969	S	0.3	16.11	6.8		10.09	
5AMHN052.34	7/3/1969	S	0.3	27.78	7.5		6.6	
5AMHN052.34	2/18/1970	S	0.3	7.78	7.2		12.79	
5AMHN052.34	3/11/1970	S	0.3	10	6.8		10.29	
5AMHN052.34	4/16/1970	S	0.3	13.33	6.9		11	
5AMHN052.34	5/12/1970	S	0.3	21.67			8.9	
5AMHN052.34	6/18/1970	S	0.3	27.22	7		6.8	
5AMHN052.34	6/29/1970	S	0.3	24.44	7.3		8.4	
5AMHN052.34	8/31/1970	S	0.3	27.78	6.8		6.6	
5AMHN052.34	10/1/1970	S	0.3	17.22	6.8		7.06	
5AMHN052.34	11/9/1970	S	0.3	13.89	7.2		10	
5AMHN052.34	12/6/1970	S	0.3	7.22	7		11.39	
5AMHN052.34	1/11/1971	S	0.3	3.33	6.7		13.39	
5AMHN052.34	2/3/1971	S	0.3	2.22	7		14.39	
5AMHN052.34	3/21/1971	S	0.3	10	7.3		11.79	
5AMHN052.34	4/26/1971	S	0.3	16.67	7.5		9	
5AMHN052.34	5/5/1971	S	0.3	15.56	7.3		9.8	
5AMHN052.34	6/10/1971	S	0.3	25.56	7		8	
5AMHN052.34	7/26/1971	S	0.3	26.11	6.7		7.4	
5AMHN052.34	8/17/1971	S	0.3	25.56	7.2		7.2	
5AMHN052.34	9/22/1971	S	0.3	21.11	7		7.4	
5AMHN052.34	11/8/1971	S	0.3	12.22	7.3		10.79	
5AMHN052.34	12/1/1971	S	0.3	6.67	6.9		12.39	
5AMHN052.34	1/17/1972	S	0.3	4.44	7.2		13.39	
5AMHN052.34	2/7/1972	S	0.3	4.44	6.7		13.59	
5AMHN052.34	3/27/1972	S	0.3	6.11	6.7		10	
5AMHN052.34	4/12/1972	S	0.3	11.11	6.8		11	
5AMHN052.34	5/3/1972	S	0.3	18.89	7.2		8.2	
5AMHN052.34	5/31/1972	S	0.3	20.56	7.2		8.4	
5AMHN052.34	7/12/1972	S	0.3	22.22	7.3		8.1	
5AMHN052.34	8/3/1972	S	0.3	25.56	7.3		7.6	
5AMHN052.34	9/11/1972	S	0.3	25	7.2		7.8	
5AMHN052.34	10/5/1972	S	0.3	18.89	6.7		8	
5AMHN052.34	11/13/1972	S	0.3	12.22	6.7		13	
5AMHN052.34	12/18/1972	S	0.3	5.56	6.8		9.8	
5AMHN052.34	1/3/1973	S	0.3	8.89	6.8		11	
5AMHN052.34	2/15/1973	S	0.3	5.56	7.2		13.19	
5AMHN052.34	3/15/1973	S	0.3	16.67	7.2		10.39	
5AMHN052.34	4/24/1973	S	0.3	20	7.5		9	
5AMHN052.34	6/19/1973	S	0.3	24.44	6.8		8	
5AMHN052.34	7/29/1973	S	0.3	23.33			8.2	
5AMHN052.34	9/16/1973	S	0.3	23.33	7.2			
5AMHN052.34	10/3/1973	S	0.3	22.22	7.2		7.6	
5AMHN052.34	11/6/1973	S	0.3	13.33	7.6		9.8	
5AMHN052.34	12/13/1973	S	0.3	5.56	7.8		11.79	
5AMHN052.34	1/9/1974	S	0.3	7.78	7.5		12	
5AMHN052.34	2/12/1974	S	0.3	4.44	7.5		12.19	
5AMHN052.34	3/6/1974	S	0.3	14.44	6.8		10	
5AMHN052.34	4/25/1974	S	0.3	15.56	7.5		9.2	
5AMHN052.34	5/9/1974	S	0.3	15.56	7.7		9.4	
5AMHN052.34	6/20/1974	S	0.3	26.67	7.5		8	
5AMHN052.34	7/7/1974	S	0.3	25.56	7.5		7.8	
5AMHN052.34	8/22/1974	S	0.3	25.56	7.4		7.2	
5AMHN052.34	9/3/1974	S	0.3	26.11	7.2		7.6	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical
5AMHN052.34	10/14/1974	S	0.3	15	7		7.2	
5AMHN052.34	11/19/1974	S	0.3	8.89	7		9	
5AMHN052.34	12/10/1974	S	0.3	4.44	7		12	
5AMHN052.34	1/10/1975	S	0.3	3.33	7		12	
5AMHN052.34	2/27/1975	S	0.3	7.22	7		11.29	
5AMHN052.34	3/12/1975	S	0.3	3.33	7.4		12	
5AMHN052.34	4/29/1975	S	0.3	16.67	7		9.2	
5AMHN052.34	5/19/1975	S	0.3	19.44	7		9.6	
5AMHN052.34	6/17/1975	S	0.3	25.56	7.5		7.8	
5AMHN052.34	7/16/1975	S	0.3	22.22	6.4		8.4	
5AMHN052.34	8/14/1975	S	0.3		7		7.6	
5AMHN052.34	9/16/1975	S	0.3	21.11	7.5		8.6	
5AMHN052.34	10/28/1975	S	0.3	17.78	7.5		9.2	
5AMHN052.34	11/11/1975	S	0.3	15.56	7.5		9.6	
5AMHN052.34	12/16/1975	S	0.3	7.78	6.8		12	
5AMHN052.34	1/21/1976	S	0.3	2.22	7		14.39	
5AMHN052.34	3/8/1976	S	0.3	13.89	7.4		10.19	
5AMHN052.34	4/13/1976	S	0.3	13.89	7.8		10.29	
5AMHN052.34	5/19/1976	S	0.3	17	7.3		7	
5AMHN052.34	6/14/1976	S	0.3	22.78	7.9		7.5	
5AMHN052.34	7/19/1976	S	0.3	26.67	7.5		6.8	
5AMHN052.34	8/23/1976	S	0.3	26.67	7.5		7.4	
5AMHN052.34	11/18/1976	S	0.3	6.67	7.5		12.19	
5AMHN052.34	11/30/1976	S	0.3	8.33	7.6		11.79	
5AMHN052.34	2/15/1977	S	0.3		7.5		12.19	
5AMHN052.34	3/14/1977	S	0.3	1.5	7		9	
5AMHN052.34	5/4/1977	S	0.3	19	8.8		8	
5AMHN052.34	7/18/1977	S	0.3	2.9	7		6.3	
5AMHN052.34	8/8/1977	S	0.3	3.3	7.8		5.6	
5AMHN052.34	11/3/1977	S	0.3	15	7		9.5	
5AMHN052.34	12/5/1977	S	0.3	0.9	9		11.39	
5AMHN052.34	2/9/1978	S	0.3	0.3	8		14.39	
5AMHN052.34	4/5/1978	S	0.3	16.19	7.5		10	
5AMHN052.34	6/8/1978	S	0.3	24	7.5		8	
5AMHN052.34	7/10/1978	S	0.3	26	7.3		7.5	
5AMHN052.34	8/22/1978	S	0.3	27	7		6.9	
5AMHN052.34	8/31/1978	S	0.3	27	7.4		6.1	
5AMHN052.34	10/5/1978	S	0.3	18.5	7.5		8.7	
5AMHN052.34	12/6/1978	S	0.3	11	6.5		10.6	
5AMHN052.34	6/22/1979	S	0.3		7.6		8	
5AMHN052.34	8/14/1979	S	0.3	23	7.5		8.3	
5AMHN052.34	10/17/1979	S	0.3	13.5	7.3		10.3	
5AMHN052.34	11/20/1979	S	0.3	11	7.5		10.8	
5AMHN052.34	12/18/1979	S	0.3	6	7.3		12.4	
5AMHN052.34	1/14/1980	S	0.3	5	6.3		13.2	
5AMHN052.34	2/20/1980	S	0.3	5	7.2		9.6	
5AMHN052.34	3/26/1980	S	0.3	10.5	7.5		11.3	
5AMHN052.34	4/23/1980	S	0.3	18.5	7.5		8.8	
5AMHN052.34	5/21/1980	S	0.3	23	7.5		9	
5AMHN052.34	6/25/1980	S	0.3	23	7.6		7.3	
5AMHN052.34	7/9/1980	S	0.3	27	7.5		7.2	
5AMHN052.34	8/5/1980	S	0.3	30	7		4.6	
5AMHN052.34	9/30/1980	S	0.3					
5AMHN052.34	10/28/1980	S	0.3	13	7.1		9.2	
5AMHN052.34	11/18/1980	S	0.3	8	7		11.1	
5AMHN052.34	1/27/1981	S	0.3	4.5	7.1		9.8	
5AMHN052.34	2/24/1981	S	0.3	9	7		12.2	
5AMHN052.34	3/24/1981	S	0.3	8	7.5		11.5	
5AMHN052.34	4/21/1981	S	0.3	18			9.8	
5AMHN052.34	5/19/1981	S	0.3	18	7		7.8	
5AMHN052.34	6/2/1981	S	0.3	20	7.5		7.8	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical
5AMHN052.34	7/1/1981	S	0.3	25.5	7.1		5.8	
5AMHN052.34	8/3/1981	S	0.3	25.5	6.7		5.2	
5AMHN052.34	9/1/1981	S	0.3	25	6.8		5.8	
5AMHN052.34	10/22/1981	S	0.3	15.5	7.1		6.2	
5AMHN052.34	11/30/1981	S	0.3	7			10.2	
5AMHN052.34	12/10/1981	S	0.3	4	7.3		10.4	
5AMHN052.34	1/5/1982	S	0.3	5.5	6.6		10.2	
5AMHN052.34	2/3/1982	S	0.3	5	6.1		8.8	
5AMHN052.34	3/3/1982	S	0.3	6	6.6		9.8	
5AMHN052.34	4/7/1982	S	0.3	12	7		8.1	
5AMHN052.34	5/4/1982	S	0.3	19	7.3		8.1	
5AMHN052.34	7/6/1982	S	0.3	25	7.1		6.8	
5AMHN052.34	8/4/1982	S	0.3	25.5	6.8		7.4	
5AMHN052.34	9/15/1982	S	0.3	21	7.3		7.4	
5AMHN052.34	10/6/1982	S	0.3	20.5	7		8.3	
5AMHN052.34	11/4/1982	S	0.3	15	7		10	
5AMHN052.34	12/2/1982	S	0.3	10.5	6.7		11.6	
5AMHN052.34	1/5/1983	S	0.3	5	7		12.2	
5AMHN052.34	2/8/1983	S	0.3	4	6.5		12.8	
5AMHN052.34	3/3/1983	S	0.3	9	6.7		12.5	
5AMHN052.34	4/5/1983	S	0.3	12	6.8		11	
5AMHN052.34	5/5/1983	S	0.3	20.5	7.5		9.4	
5AMHN052.34	6/7/1983	S	0.3	23	7.5		8.4	
5AMHN052.34	8/3/1983	S	0.3	27	7.1		6.1	
5AMHN052.34	9/19/1983	S	0.3	22.5	6.8		11.2	
5AMHN052.34	10/17/1983	S	0.3	17.5	7		8.8	
5AMHN052.34	11/9/1983	S	0.3	14.5	7		9.3	
5AMHN052.34	12/7/1983	S	0.3	8.5	6.8		11.6	
5AMHN052.34	1/31/1984	S	0.3	4	6.7		12.3	
5AMHN052.34	3/7/1984	S	0.3	7.5	7		12.5	
5AMHN052.34	4/2/1984	S	0.3	11	6.4		11.2	
5AMHN052.34	4/30/1984	S	0.3	18.5	6.9		9.7	
5AMHN052.34	6/18/1984	S	0.3	27	6.5		6.4	
5AMHN052.34	7/23/1984	S	0.3	25	6.53		7.9	
5AMHN052.34	8/20/1984	S	0.3	25	6.68		7.9	
5AMHN052.34	9/17/1984	S	0.3	20.6	6.8		9.5	
5AMHN052.34	10/17/1984	S	0.3	17.1	6.65		8.9	
5AMHN052.34	11/14/1984	S	0.3	7	6.4		14.8	
5AMHN052.34	1/30/1985	S	0.3	1.1	6.7		16.1	
5AMHN052.34	2/6/1985	S	0.3	2.5	5.7		13.2	
5AMHN052.34	3/13/1985	S	0.3	7.5	6.4		13.3	
5AMHN052.34	4/9/1985	S	0.3	15	7.5		10.6	
5AMHN052.34	4/10/1985	S	0.3	14	7		10	
5AMHN052.34	5/15/1985	S	0.3	21	7.3		8.8	
5AMHN052.34	5/22/1985	S	0.3	25			8	
5AMHN052.34	6/4/1985	S	0.3	24.5	7.5		7.8	
5AMHN052.34	7/10/1985	S	0.3	27.4	6.8		5	
5AMHN052.34	8/6/1985	S	0.3	24	6.9		7.7	
5AMHN052.34	10/30/1985	S	0.3	12	6.7		10.8	
5AMHN052.34	12/9/1985	S	0.3	6.5	7.2		13	
5AMHN052.34	1/9/1986	S	0.3	3	6.8		12.8	
5AMHN052.34	2/10/1986	S	0.3	6.5	6.8		14	
5AMHN052.34	3/10/1986	S	0.3	8	7.2		11.9	
5AMHN052.34	4/7/1986	S	0.3	20	8.17		9.5	
5AMHN052.34	5/14/1986	S	0.3	16.8	7.32		8.4	
5AMHN052.34	6/17/1986	S	0.3	27	7.7		7.3	
5AMHN052.34	7/17/1986	S	0.3	29	7.24		6.1	
5AMHN052.34	8/14/1986	S	0.3	23	6.75		5.8	
5AMHN052.34	9/17/1986	S	0.3	21.5	7.58		7.9	
5AMHN052.34	10/22/1986	S	0.3	16	5.9		6.6	
5AMHN052.34	11/24/1986	S	0.3	8.5	8.06		9.4	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical
5AMHN052.34	12/15/1986	S	0.3	5	7.91		10.2	
5AMHN052.34	1/20/1987	S	0.3	5.5	7.08		13.2	
5AMHN052.34	2/12/1987	S	0.3	4	7.51		12.7	
5AMHN052.34	3/23/1987	S	0.3	9	7.88		11.1	
5AMHN052.34	4/21/1987	S	0.3	14	7.7		8.5	
5AMHN052.34	5/11/1987	S	0.3	19	7.95		8.6	
5AMHN052.34	6/8/1987	S	0.3	25.6	6.72		5.1	
5AMHN052.34	6/8/1987	S	0.3	25.6	6.72		5	
5AMHN052.34	7/6/1987	S	0.3	26	7.38		6.1	
5AMHN052.34	8/11/1987	S	0.3	28.5	7.27		4.6	
5AMHN052.34	9/16/1987	S	0.3	24.5	7.23		5.8	
5AMHN052.34	10/15/1987	S	0.3	13	7.81		9.6	
5AMHN052.34	11/23/1987	S	0.3	8	7.94		10.6	
5AMHN052.34	12/8/1987	S	0.3	5	7.7		11.2	
5AMHN052.34	1/19/1988	S	0.3	1	7.57		12.4	
5AMHN052.34	2/16/1988	S	0.3	5.3	7.4		12.7	
5AMHN052.34	3/15/1988	S	0.3	8.2	7.89		9.4	
5AMHN052.34	4/12/1988	S	1	12.1	7.57		9.8	
5AMHN052.34	5/11/1988	S	0.3	18.3	7.17		7.8	
5AMHN052.34	6/8/1988	S	0.3	22	7.96		7.2	
5AMHN052.34	7/12/1988	S	0.3	27	6.86		3.7	
5AMHN052.34	8/25/1988	S	0.3	26.1	7.56		3.8	
5AMHN052.34	9/20/1988	S	0.3	23	7.08		4.7	
5AMHN052.34	10/18/1988	S	0.3	11	8.05		9.2	
5AMHN052.34	11/9/1988	S	0.3	8.3	7.19		9.8	
5AMHN052.34	12/19/1988	S	0.3	4.5	8		12.9	
5AMHN052.34	1/31/1989	S	0.3	7.4	6.49		12.4	
5AMHN052.34	2/27/1989	S	0.3					
5AMHN052.34	3/20/1989	S	0.3	12	8.05		10.8	
5AMHN052.34	4/18/1989	S	0.3	15.1	7.48		10.8	
5AMHN052.34	5/23/1989	S	0.3	21	8		8.4	
5AMHN052.34	6/22/1989	S	0.3	24.1	7.77		5.9	
5AMHN052.34	7/24/1989	S	0.3	26.6	7		4.7	
5AMHN052.34	8/15/1989	S	0.3	21.8	7.25		7.5	
5AMHN052.34	9/19/1989	S	0.3	21.7	8.05		5.2	
5AMHN052.34	10/19/1989	S	0.3	16	8.07		7.7	
5AMHN052.34	11/16/1989	S	0.3	13.6	7.88		8.9	
5AMHN052.34	12/28/1989	S	0.3	0.5	7.31		14.3	
5AMHN052.34	1/31/1990	S	0.3	7.6	7.6		11.4	
5AMHN052.34	2/20/1990	S	0.3					
5AMHN052.34	3/20/1990	S	0.3	13.6	6.58		9.2	
5AMHN052.34	4/18/1990	S	0.3	15.3	7.54		8.8	
5AMHN052.34	5/17/1990	S	0.3	19.8	6.59		7.4	
5AMHN052.34	6/19/1990	S	0.3	23.3	7.28		6.1	
5AMHN052.34	7/16/1990	S	0.3	26.3	6.62		3.4	
5AMHN052.34	8/13/1990	S	0.3	24.3	7.63		4.8	
5AMHN052.34	9/13/1990	S	0.3	24.7	6.36		4.1	
5AMHN052.34	10/11/1990	S	0.3	20.24	6.92	4.5		
5AMHN052.34	10/11/1990	B	0.3					
5AMHN052.34	11/27/1990	S	0.3	8.9	6.69	10.3	10.3	
5AMHN052.34	12/5/1990	S	0.3	8.1	7.26	10.59	10.6	
5AMHN052.34	12/5/1990	B	0.3	8.07	7.26	10.59		
5AMHN052.34	1/28/1991	S	0.3					
5AMHN052.34	2/12/1991	S	0.09	6.76	7.69	11.86	11.9	
5AMHN052.34	2/12/1991	B	0.3	6.8	7.69		11.9	
5AMHN052.34	3/28/1991	S	0.09			9.16		
5AMHN052.34	3/28/1991	B	0.3	15.77	6.71	9.16		
5AMHN052.34	4/29/1991	S	0.09	18.33	6.34	8.77	8.8	
5AMHN052.34	4/29/1991	B	0.3					
5AMHN052.34	5/23/1991	S	0.3	20.3	7.16		7.54	
5AMHN052.34	6/19/1991	S	0.3	25.98	6.26		2.82	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical
5AMHN052.34	7/22/1991	S	0.3	30.28	6.3		2.76	
5AMHN052.34	8/20/1991	S	0.3	26.08	6.52	2.33		
5AMHN052.34	9/19/1991	S	0.3	26.47	6.16	2.53		
5AMHN052.34	9/19/1991	S	0.3					
5AMHN052.34	10/21/1991	S	0.3	13.11	6.3	7.78		
5AMHN052.34	11/25/1991	S	0.3	11.15	6.9	8.75		
5AMHN052.34	12/19/1991	S	0.3	5.62	6.71	10.86		
5AMHN052.34	1/10/1992	S	0.3	1	6	12		
5AMHN052.34	1/16/1992	S	0.3	5.65	6.15	10.93		
5AMHN052.34	2/25/1992	S	0.3	9.21	6.67	10.9		
5AMHN052.34	3/18/1992	S	0.3	8.04	5.5	11.09		
5AMHN052.34	4/28/1992	S	0.3	16.65	6.09	7.18		
5AMHN052.34	5/20/1992	S	0.3	19.33	5.99	5.78		
5AMHN052.34	6/22/1992	S	0.3	21.21	6.01	5.46		
5AMHN052.34	7/13/1992	S	0.3	29.37	6.16	4.14		
5AMHN052.34	8/20/1992	S	0.3	22.26	6.38	8.03		
5AMHN052.34	9/21/1992	S	0.3	21.62	6.8	7.8		
5AMHN052.34	10/20/1992	S	0.3	13.55	6.51	8.05		
5AMHN052.34	11/12/1992	S	0.3	10.27	6.86	8.68		
5AMHN052.34	12/8/1992	S	0.3	5.24	6.93	10.85		
5AMHN052.34	1/19/1993	S	0.3	5.74	6.68	10.73		
5AMHN052.34	2/17/1993	S	0.3	6.15	6.6	11.83		
5AMHN052.34	3/16/1993	S	0.3	4.74	6.02	13.37		
5AMHN052.34	4/14/1993	S	0.3	14.09	6.44	9.65		
5AMHN052.34	5/17/1993	S	0.3	20.09	6.33	6.81		
5AMHN052.34	6/9/1993	S	0.3	21.9	6.15	6		
5AMHN052.34	7/14/1993	S	0.3	29.4	6.23	2.94		
5AMHN052.34	8/11/1993	S	0.3	24.86	6	2.22		
5AMHN052.34	9/23/1993	S	0.3	24.01	6.68	2.39		
5AMHN052.34	10/21/1993	S	0.3	19.06	6.88	6.63		
5AMHN052.34	11/15/1993	S	0.3	12.46	6.74	8.62		
5AMHN052.34	12/15/1993	S	0.3	4.79	6.61	11.52		
5AMHN052.34	1/25/1994	S	0.3	0.48	6.65	12.74		
5AMHN052.34	2/16/1994	S	0.3	4.43	6.47	12.67		
5AMHN052.34	3/14/1994	S	0.3	9.01	6.31	10.76		
5AMHN052.34	4/13/1994	S	0.3	16.34	6.57	8.4		
5AMHN052.34	5/12/1994	S	0.3	17.85	6.53	7.88		
5AMHN052.34	6/13/1994	S	0.3	22.93	6.59	5.72		
5AMHN052.34	7/12/1994	S	0.3	28.38	6.55	2.81		
5AMHN052.34	7/13/1994	S	0.3	28.63	6.55	2.25		
5AMHN052.34	8/4/1994	S	0.3	26.54	6.63	5.37		
5AMHN052.34	9/14/1994	S	0.3	23.29	6.49	4.58		
5AMHN052.34	10/6/1994	S	0.3	18.63	6.63	4.93		
5AMHN052.34	11/3/1994	S	0.3	12.67	6.6	6.07		
5AMHN052.34	12/19/1994	S	0.3	7.16	6.91	10.68		
5AMHN052.34	1/23/1995	S	0.3	6	6.9	10.56		
5AMHN052.34	2/21/1995	S	0.3	7.22	6.77	10.93		
5AMHN052.34	3/8/1995	S	0.3	10.8	6.81	10.21		
5AMHN052.34	4/11/1995	S	0.3	14.96	6.85	8.46		
5AMHN052.34	5/8/1995	S	0.3	16.65	6.61	7.41		
5AMHN052.34	6/6/1995	S	0.3	23.15	6.6	5.44		
5AMHN052.34	7/5/1995	S	0.3	24.22	6.44	6.78		
5AMHN052.34	8/3/1995	S	0.3	29.74	6.62	1.24		
5AMHN052.34	9/6/1995	S	0.3	24.24	6.65	3.54		
5AMHN052.34	10/2/1995	S	0.3	20.82	6.67	3.64		
5AMHN052.34	11/6/1995	S	0.3	12.89	6.41	6.51		
5AMHN052.34	12/6/1995	S	0.3	7.35	6.72	10.45		
5AMHN052.34	1/4/1996	S	0.3	3.23	6.78	12.87		
5AMHN052.34	2/14/1996	S	0.3	3.69	6.41	11.91		
5AMHN052.34	3/28/1996	S	0.3	10.27	6.54	10.22		
5AMHN052.34	4/9/1996	S	0.3	10.77	6.55	10.15		

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical
5AMHN052.34	5/15/1996	S	0.3	17.18	6.43	7.3		
5AMHN052.34	6/17/1996	S	0.3	24.61	6.62	5.99		
5AMHN052.34	7/16/1996	S	0.3	25.98	6.33	5.31		
5AMHN052.34	8/14/1996	S	0.3	21.1	6.75	7.52		
5AMHN052.34	9/12/1996	S	0.3	22.52	6.44	8.6		
5AMHN052.34	10/28/1996	S	0.3	14.84	6.45	7.76		
5AMHN052.34	11/21/1996	S	0.3	7.72	6.46	10.42		
5AMHN052.34	12/18/1996	S	0.3	7.52	6.39	10.95		
5AMHN052.34	1/29/1997	S	0.3	5.78	6.55	12.07		
5AMHN052.34	2/11/1997	S	0.3	5.13	6.96	12.41		
5AMHN052.34	3/11/1997	S	0.3	10.75	6.94	12.27		
5AMHN052.34	4/24/1997	S	0.3	11.46	6.95	9.82		
5AMHN052.34	5/22/1997	S	0.3	20.23	6.65	7.39		
5AMHN052.34	6/18/1997	S	0.3	22.02	6.5	6.64		
5AMHN052.34	7/16/1997	S	0.3					
5AMHN052.34	8/5/1997	S	0.3	24.39	6.1	5.42		
5AMHN052.34	9/18/1997	S	0.3	22.85	6.54	4.76		
5AMHN052.34	10/15/1997	S	0.3	19.36	6.85	5.51		
5AMHN052.34	11/13/1997	S	0.3	9.72	6.77	9.4		
5AMHN052.34	12/16/1997	S	0.3	4.71	6.99	11.96		
5AMHN052.34	1/13/1998	S	0.3	9.65	6.5	10.3		
5AMHN052.34	2/10/1998	S	0.3	5.88	6.89	11.62		
5AMHN052.34	3/9/1998	S	0.3	12.82	6.35	11.25		
5AMHN052.34	4/9/1998	S	0.3	15.61	6.64	8.99		
5AMHN052.34	5/21/1998	S	0.3	21.59	6.8	7.95		
5AMHN052.34	6/17/1998	S	0.3	23.93	6.71	5.97		
5AMHN052.34	7/23/1998	S	0.3	28.94	6.59	4.29		
5AMHN052.34	8/26/1998	S	0.3	26.34	6.32	3		
5AMHN052.34	9/29/1998	S	0.3	24.35	6.45	3.05		
5AMHN052.34	10/29/1998	S	0.3	15.22	6.64	6.35		
5AMHN052.34	11/30/1998	S	0.3	10	6.55	8.89		
5AMHN052.34	12/17/1998	S	0.3	6.37	6.41	11.2		
5AMHN052.34	1/20/1999	S	0.3	6.91	6.31	10.98		
5AMHN052.34	2/17/1999	S	0.3	6.62	6.57	11.28		
5AMHN052.34	3/29/1999	S	0.3	11.96	6.43	9.73		
5AMHN052.34	4/15/1999	S	0.3	13.97	6.45	7.9		
5AMHN052.34	5/24/1999	S	0.3	21.14	6.6	6.21		
5AMHN052.34	6/17/1999	S	0.3	22.89	6.62	5.02		
5AMHN052.34	7/13/1999	S	0.3	23.93	6.34	2.53		
5AMHN052.34	8/12/1999	S	0.3	26.8	6.43	2.48		
5AMHN052.34	9/2/1999	S	0.3	22.15	6.04	3.97		
5AMHN052.34	10/26/1999	S	0.3	10.81	6.42	9.46		
5AMHN052.34	11/8/1999	S	0.3	10.04	6.32	8.31		
5AMHN052.34	12/21/1999	S	0.3	7.45	6.44	10.71	10.6	
5AMHN052.34	1/12/2000	S	0.3	9.47	6.87	11.8		
5AMHN052.34	2/24/2000	S	0.3					
5AMHN052.34	3/20/2000	S	0.3	10.85	6.3	10.28		
5AMHN052.34	4/17/2000	S	0.3	16.36	6.41	9.18		
5AMHN052.34	5/15/2000	S	0.3	22.32	6.65	7.86		
5AMHN052.34	6/26/2000	S	0.3	26.16	6.63	4.62		
5AMHN052.34	7/24/2000	S	0.3	23.61	5.91	5.94		
5AMHN052.34	8/14/2000	S	0.3	25.07	5.89	5.7		
5AMHN052.34	9/7/2000	S	0.3	20.72	6.23	6.98		
5AMHN052.34	10/19/2000	S	0.3	15.26	6.42	7.95		
5AMHN052.34	11/15/2000	S	0.3	11.2	6.95	8.27		
5AMHN052.34	12/14/2000	S	0.3	3.59	6.67	12.95		
5AMHN052.34	1/9/2001	S	0.3	0.61	6.63	12.21		
5AMHN052.34	2/12/2001	S	0.3	7.43	6.97	10.65	11.2	
5AMHN052.34	3/8/2001	S	0.3	6.52	6.46	11.3		
5AMHN052.34	4/9/2001	S	0.3	16.55	6.35	8.21		
5AMHN052.34	6/20/2001	S	0.3	23.68	6.27	5.7		

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical
5AMHN052.34	8/27/2001	S	0.3	25.77	6.42	5.64		
5AMHN052.34	10/9/2001	S	0.3	16.63	6.56	6.95		
5AMHN052.34	12/20/2001	S	0.3	10.09	6.65	8.97		
5AMHN052.34	2/25/2002	S	0.3	8.89	6.96	10.41		
5AMHN052.34	4/18/2002	S	0.3	23.54	6.66	5.13		
5AMHN052.34	7/2/2002	S	0.3	27.35	6.77	3.32		
5AMHN052.34	7/30/2002	S	0.3	29.05	6.61	4.04		
5AMHN052.34	9/5/2002	S	0.3	24.8	6.65	3.38		
5AMHN052.34	11/25/2002	S	0.3	7.92	6.51	10.9		
5AMHN052.34	1/30/2003	S	0.3	0.69	7.02	13.7		
5AMHN052.34	3/27/2003	S	0.3	14.57	6.69	9.42		
5AMHN052.34	5/22/2003	S	0.3	16.11	6.35	9.39		
5AMHN052.34	7/14/2003	S	0.3	26.05	6.93	5.55		
5AMHN052.34	9/29/2003	S	0.3	20.17	6.62	6.63		
5AMHN052.34	12/1/2003	S	0.3	8.01	6.89	10.74		
5AMHN052.34	1/29/2004	S	0.3	0.4	7.04	13.74		
5AMHN052.34	3/16/2004	S	0.3	10.36	6.62	10.37		
5AMHN052.34	5/25/2004	S	0.3	26.13	6.6	5.28		
5AMHN052.34	8/24/2004	S	0.3	23.4	6.65	6.45		
5AMHN052.34	10/13/2004	S	0.3	15.46	6.76	8.57		
5AMHN052.34	12/8/2004	S	0.3	9.1	6.85	10.78		
5AMHN052.34	2/14/2005	S	0.3	6.2	7.4	11.49		
5AMHN052.34	4/25/2005	S	0.3	15.73	6.91	8.43		
5AMHN052.34	6/7/2005	S	0.3	21.4	6.91	6.52		
5AMHN052.34	8/4/2005	S	0.3	27.12	6.67	3.2		
5AMHN052.34	10/24/2005	S	0.3	16.2	7.28	4.66		
5AMHN052.34	12/19/2005	S	0.3	4.65	6.98	12.27		
5AMHN052.34	2/22/2006	S	0.3	5.58	7.11	12.52		
5AMHN052.34	4/13/2006	S	0.3	16.1	7.3	8.5		
5AMHN052.34	4/13/2006	S	0					
5AMHN052.34	6/26/2006	S	0.3	25.3	6.6	3.2		
5AMHN052.34	8/17/2006	S	0.3	25.8	7	2.9		
5AMHN052.34	10/18/2006	S	0.3	13.2	6.7	8.3		
5AMHN052.34	12/19/2006	S	0.3	6.5	6.6	13.4		
5AMHN052.34	1/16/2007	S	0.3	10.5	6.9	10.6		
5AMHN052.34	3/8/2007	S	0.3	7.1	7	11.4		
5AMHN052.34	5/16/2007	S	0.3	19.4	7	6.7		
5AMHN052.34	7/12/2007	S	0.3	27.7	7.1			3.2
5AMHN052.34	9/13/2007	S	0.3	25.7	7	3.1		
5AMHN052.34	11/19/2007	S	0.3	9.6	7.1	6.9		
5AMHN052.34	1/14/2008	S	0.3	7.5	7.5	10		
5AMHN052.34	3/3/2008	S	0.3	8	7.3	11.8		
5AMHN052.34	5/13/2008	S	0.3	14.5	6.9	10.1		
5AMHN052.34	7/8/2008	S	0.3	25.7	6.8	2.4		
5AMHN052.34	9/24/2008	S	0.3	20.9	7	4.9		
5AMHN052.34	11/17/2008	S	0.3	12.1	6.9	8		
5AMHN052.34	2/4/2009	S	0.3	4.1	6.8	12.4		
5AMHN052.34	4/7/2009	S	0.3	14.6	7	8.3		
5AMHN052.34	6/3/2009	S	0.3	25.4	6.9	4.9		
5AMHN052.34	8/4/2009	S	0.3	27.2	6.8	3.1		
5AMHN052.34	10/6/2009	S	0.3	18.6	7.4	6.4		
5AMHN052.34	12/2/2009	S	0.3	8.3	7.3	10.9		
5AMHN052.34	1/5/2010	S	0.3	0.8	7.3	13.7		
5AMHN052.34	3/2/2010	S	0.3	5.3	7.3	12.2		
5AMHN052.34	5/12/2010	S	0.3	19.1	7.1	5.8		
5AMHN052.34	7/12/2010	S	0.3	27.9	6.9	2.6		
5AMHN052.34	9/15/2010	S	0.3	23.1	6.9	3.1		
5AMHN052.34	11/8/2010	S	0.3	10.3	6.8	9.8		
5AMHN052.34	2/7/2011	S	0.3	5.1	7.3	13.1		
5AMHN052.34	4/6/2011	S	0.3	12.8	7	9.1		
5AMHN052.34	6/8/2011	S	0.3	26.2	7.1	4.7		

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical
5AMHN052.34	8/15/2011	S	0.3	27.1	7.2	4		
5AMHN052.34	10/5/2011	S	0.3	18.9	6.7	5.7		
90th Percentile				26.1	7.5			
10th Percentile				4.9	6.4			

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					HARDNESS, TOTAL (MG/L AS CaCO3)	
Sta Id	Collection Date Time	Depth Desc	Depth	Container Id Desc	Value	Com Code
5AMHN052.34	12/19/1988 14:05	S	0.3	R	26	
5AMHN052.34	02/27/1989 10:10	S	0.3	R	18	
5AMHN052.34	04/18/1989 11:10	S	0.3	R	16	
5AMHN052.34	05/23/1989 16:00	S	0.3	R	24	
5AMHN052.34	06/22/1989 13:20	S	0.3	R	24	
5AMHN052.34	07/24/1989 11:00	S	0.3	R	26	
5AMHN052.34	09/19/1989 11:05	S	0.3	R	26	
5AMHN052.34	10/19/1989 10:45	S	0.3	R	30	
5AMHN052.34	11/16/1989 10:50	S	0.3	R	24	
5AMHN052.34	12/28/1989 10:35	S	0.3	R	24	
5AMHN052.34	01/31/1990 16:00	S	0.3	R	19	
5AMHN052.34	02/20/1990 11:20	S	0.3	R	22	
5AMHN052.34	03/20/1990 10:40	S	0.3	R	24	
5AMHN052.34	04/18/1990 13:20	S	0.3	R	22	
5AMHN052.34	05/17/1990 10:50	S	0.3	R	28	
5AMHN052.34	06/19/1990 11:10	S	0.3	R	27	
5AMHN052.34	07/16/1990 13:45	S	0.3	R	28	
5AMHN052.34	08/13/1990 10:45	S	0.3	R	24	
5AMHN052.34	09/13/1990 11:30	S	0.3	R	42	
5AMHN052.34	10/11/1990 13:10	S	0.3	R	30	
5AMHN052.34	11/27/1990 12:00	S	0.3	R	28	
5AMHN052.34	12/05/1990 10:40	S	0.3	R	28	
5AMHN052.34	01/28/1991 12:00	S	0.3	R	32	
5AMHN052.34	02/12/1991 11:10	B	0.3	R	28	
5AMHN052.34	02/12/1991 11:10	S	0.09	R	28	
5AMHN052.34	03/28/1991 10:58	B	0.3	R	32	
5AMHN052.34	04/29/1991 12:40	S	0.09	R	32	
5AMHN052.34	05/23/1991 11:20	S	0.3	R	30	
5AMHN052.34	06/19/1991 12:00	S	0.3	R	48	
5AMHN052.34	07/22/1991 12:50	S	0.3	R	40	
5AMHN052.34	08/20/1991 10:45	S	0.3	R	26	
5AMHN052.34	09/19/1991 11:55	S	0.3	R	50	
5AMHN052.34	11/25/1991 10:23	S	0.3	R	26	
5AMHN052.34	12/19/1991 11:00	S	0.3	R	34	
5AMHN052.34	01/16/1992 12:08	S	0.3	R	22	
5AMHN052.34	02/25/1992 09:50	S	0.3	R	26	
5AMHN052.34	03/18/1992 10:45	S	0.3	R	15	
5AMHN052.34	04/28/1992 12:20	S	0.3	R	26	
5AMHN052.34	05/20/1992 10:10	S	0.3	R	26	
5AMHN052.34	06/22/1992 10:45	S	0.3	R	34	
5AMHN052.34	07/13/1992 12:37	S	0.3	R	36	
5AMHN052.34	08/20/1992 10:49	S	0.3	R	26	
5AMHN052.34	09/21/1992 10:40	S	0.3	R	36	
5AMHN052.34	10/20/1992 12:27	S	0.3	R	34	
5AMHN052.34	11/12/1992 10:30	S	0.3	R	35	
5AMHN052.34	12/08/1992 11:15	S	0.3	R	27	
5AMHN052.34	01/19/1993 12:11	S	0.3	R	22	
5AMHN052.34	02/17/1993 11:21	S	0.3	R	26	

					00900	
					HARDNESS, TOTAL (MG/L AS CaCO3)	
Sta Id	Collection Date Time	Depth Desc	Depth	Container Id Desc	Value	Com Code
5AMHN052.34	03/16/1993 11:11	S	0.3	R	20	
5AMHN052.34	04/14/1993 10:33	S	0.3	R	24	
5AMHN052.34	05/17/1993 10:55	S	0.3	R	22	
5AMHN052.34	07/14/1993 11:50	S	0.3	R	40	
5AMHN052.34	08/11/1993 10:30	S	0.3	R	26	
5AMHN052.34	09/23/1993 12:55	S	0.3	R	40	
5AMHN052.34	10/21/1993 12:11	S	0.3	R	46	
5AMHN052.34	11/15/1993 11:22	S	0.3	R	40	
5AMHN052.34	12/15/1993 11:00	S	0.3	R	34	
5AMHN052.34	01/25/1994 11:55	S	0.3	R	24	
5AMHN052.34	02/16/1994 12:00	S	0.3	R	16	
5AMHN052.34	03/14/1994 11:56	S	0.3	R	18	
5AMHN052.34	04/13/1994 13:00	S	0.3	R	21	
5AMHN052.34	05/12/1994 10:30	S	0.3	R	24	
5AMHN052.34	06/13/1994 11:45	S	0.3	R	26	
5AMHN052.34	07/12/1994 14:14	S	0.3	R	26	
5AMHN052.34	08/04/1994 14:00	S	0.3	R	22	
5AMHN052.34	09/14/1994 12:22	S	0.3	R	22	
5AMHN052.34	10/06/1994 13:12	S	0.3	R	20	
5AMHN052.34	11/03/1994 11:11	S	0.3	R	26	
5AMHN052.34	12/19/1994 10:22	S	0.3	R	26	
5AMHN052.34	01/23/1995 13:22	S	0.3	R	23	
5AMHN052.34	02/21/1995 12:22	S	0.3	R	27	
5AMHN052.34	03/08/1995 13:00	S	0.3	R	24	
5AMHN052.34	04/11/1995 13:49	S	0.3	R	31	
5AMHN052.34	05/08/1995 10:30	S	0.3	R	24	
5AMHN052.34	06/06/1995 10:44	S	0.3	R	30	
5AMHN052.34	07/05/1995 15:30	S	0.3	R	24	
5AMHN052.34	08/03/1995 12:45	S	0.3	R	42	
5AMHN052.34	09/06/1995 09:00	S	0.3	R	32	
5AMHN052.34	10/02/1995 12:34	S	0.3	R	40	
5AMHN052.34	11/06/1995 10:40	S	0.3	R	30	
5AMHN052.34	12/06/1995 15:15	S	0.3	R	27	
5AMHN052.34	01/04/1996 13:41	S	0.3	R	26	
5AMHN052.34	02/14/1996 10:30	S	0.3	R	21	
5AMHN052.34	03/28/1996 12:30	S	0.3	R	28	
5AMHN052.34	04/09/1996 15:00	S	0.3	R	22	
5AMHN052.34	05/15/1996 12:44	S	0.3	R	24	
5AMHN052.34	06/17/1996 11:31	S	0.3	R	22	
5AMHN052.34	07/16/1996 13:52	S	0.3	R	25	
5AMHN052.34	08/14/1996 11:22	S	0.3	R	22	
5AMHN052.34	09/12/1996 09:00	S	0.3	R	22	
5AMHN052.34	10/28/1996 11:30	S	0.3	R	35	
5AMHN052.34	11/21/1996 10:40	S	0.3	R	26	
5AMHN052.34	12/18/1996 09:30	S	0.3	R	22	
5AMHN052.34	01/29/1997 13:40	S	0.3	R	25	
5AMHN052.34	02/11/1997 09:45	S	0.3	R	24	
5AMHN052.34	03/11/1997 09:45	S	0.3	R	24.3	

					00900	
					HARDNESS, TOTAL (MG/L AS CaCO3)	
Sta Id	Collection Date Time	Depth Desc	Depth	Container Id Desc	Value	Com Code
5AMHN052.34	04/24/1997 12:11	S	0.3	R	24.3	
5AMHN052.34	05/22/1997 11:19	S	0.3	R	25.7	
5AMHN052.34	06/18/1997 09:44	S	0.3	R	26.3	
5AMHN052.34	07/16/1997 12:00	S	0.3	R	24.1	
5AMHN052.34	08/05/1997 10:20	S	0.3	R	19.6	
5AMHN052.34	09/18/1997 14:30	S	0.3	R	22.5	
5AMHN052.34	10/15/1997 10:35	S	0.3	R	26.1	
5AMHN052.34	11/13/1997 13:45	S	0.3	R	65.2	
5AMHN052.34	12/16/1997 11:30	S	0.3	R	27.7	
5AMHN052.34	01/13/1998 13:00	S	0.3	R	17.6	
5AMHN052.34	02/10/1998 11:30	S	0.3	R	22.2	
5AMHN052.34	03/09/1998 13:15	S	0.3	R	22	
5AMHN052.34	04/09/1998 11:20	S	0.3	R	15	
5AMHN052.34	05/21/1998 13:00	S	0.3	R	20.3	
5AMHN052.34	06/17/1998 07:45	S	0.3	R	22.7	
5AMHN052.34	07/23/1998 10:10	S	0.3	R	27.1	
5AMHN052.34	08/26/1998 11:15	S	0.3	R	19.6	
5AMHN052.34	09/29/1998 11:11	S	0.3	R	19.3	
5AMHN052.34	10/29/1998 11:50	S	0.3	R	28	
5AMHN052.34	11/30/1998 12:25	S	0.3	R	26	
5AMHN052.34	12/17/1998 10:55	S	0.3	R	27.1	
5AMHN052.34	01/20/1999 12:15	S	0.3	R	46	
5AMHN052.34	02/17/1999 10:10	S	0.3	R	44	
5AMHN052.34	03/29/1999 13:30	S	0.3	R	20	
5AMHN052.34	04/15/1999 12:00	S	0.3	R	28	
5AMHN052.34	05/24/1999 13:45	S	0.3	R	36	
5AMHN052.34	06/17/1999 11:33	S	0.3	R	25.9	
5AMHN052.34	07/13/1999 11:33	S	0.3	R	13	
5AMHN052.34	08/12/1999 10:50	S	0.3	R	17.5	
5AMHN052.34	09/02/1999 13:30	S	0.3	R	13.6	
5AMHN052.34	11/08/1999 12:00	S	0.3	R	16.2	
5AMHN052.34	12/21/1999 15:22	S	0.3	R	24	
5AMHN052.34	01/12/2000 14:30	S	0.3	R	25.9	
5AMHN052.34	02/24/2000 10:00	S	0.3	R	14	
5AMHN052.34	03/20/2000 13:20	S	0.3	R	19	
5AMHN052.34	04/17/2000 12:15	S	0.3	R	17	
5AMHN052.34	05/15/2000 14:40	S	0.3	R	11	
5AMHN052.34	06/26/2000 12:05	S	0.3	R	24.9	
5AMHN052.34	07/24/2000 13:00	S	0.3	R	22.5	
5AMHN052.34	08/14/2000 12:00	S	0.3	R	21.7	
5AMHN052.34	09/07/2000 13:00	S	0.3	R	13.9	
5AMHN052.34	10/19/2000 12:15	S	0.3	R	24	
5AMHN052.34	11/15/2000 12:20	S	0.3	R	28.1	
5AMHN052.34	12/14/2000 11:10	S	0.3	R	19.5	
5AMHN052.34	01/09/2001 11:30	S	0.3	R	24.2	
5AMHN052.34	02/12/2001 09:20	S	0.3	R	21.6	
5AMHN052.34	03/08/2001 11:45	S	0.3	R	12.5	
5AMHN052.34	04/09/2001 09:35	S	0.3	R	7.9	

					00900	
					HARDNESS, TOTAL (MG/L AS CaCO3)	
Sta Id	Collection Date Time	Depth Desc	Depth	Container Id Desc	Value	Com Code
5AMHN052.34	06/20/2001 12:10	S	0.3	R	15.5	
5AMHN052.34	08/27/2001 13:30	S	0.3	R	6.9	
5AMHN052.34	10/09/2001 13:40	S	0.3	R	34.1	
5AMHN052.34	12/20/2001 12:50	S	0.3	R	12.8	
5AMHN052.34	02/25/2002 13:20	S	0.3	R	35	
5AMHN052.34	04/18/2002 12:30	S	0.3	R	25.3	
5AMHN052.34	07/02/2002 14:30	S	0.3	R	52.2	
5AMHN052.34	07/30/2002 13:15	S	0.3	R	42	
5AMHN052.34	09/05/2002 13:30	S	0.3	R	18.5	
5AMHN052.34	11/25/2002 12:00	S	0.3	R	10	U
5AMHN052.34	01/30/2003 13:10	S	0.3	R	17.3	
5AMHN052.34	03/27/2003 13:25	S	0.3	R	19.8	
5AMHN052.34	07/14/2003 14:30	S	0.3	R	33.2	
5AMHN052.34	09/29/2003 13:20	S	0.3	R	15.8	
5AMHN052.34	12/01/2003 12:25	S	0.3	R	29	
5AMHN052.34	01/29/2004 13:23	S	0.3	R	31	
5AMHN052.34	03/16/2004 11:45	S	0.3	R	21.5	
5AMHN052.34	05/25/2004 11:30	S	0.3	R	26	
5AMHN052.34	08/24/2004 12:40	S	0.3	R	10	U
5AMHN052.34	10/13/2004 13:30	S	0.3	R	32	
5AMHN052.34	12/08/2004 12:22	S	0.3	R	24	
5AMHN052.34	02/14/2005 11:00	S	0.3	R	22	
5AMHN052.34	04/25/2005 12:05	S	0.3	R	26.8	
5AMHN052.34	06/07/2005 12:15	S	0.3	R	30	
5AMHN052.34	08/04/2005 12:40	S	0.3	R	24	
5AMHN052.34	10/24/2005 13:40	S	0.3	R	18	
5AMHN052.34	12/19/2005 13:22	S	0.3	R	17	
5AMHN052.34	02/22/2006 12:00	S	0.3	R	23	
5AMHN052.34	04/13/2006 12:25	S	0.3	S1	30	
5AMHN052.34	06/26/2006 13:05	S	0.3	R	20	
5AMHN052.34	08/17/2006 10:55	S	0.3	R	31	
5AMHN052.34	10/18/2006 11:15	S	0.3	R	20	
5AMHN052.34	12/19/2006 12:15	S	0.3	R	22	
5AMHN052.34	01/16/2007 11:20	S	0.3	R	20	
Average					26	

**Attachment F: Effluent Water Quality Criteria Monitoring
data, DMR data**

Application (EPA Form 2A) data

Parameter	Maximum Daily Value		Average Daily Value		
	Value	Units	Value	Units	No. Samples
pH (minimum)	6.34	S.U.			
pH (maximum)	7.80	S.U.			
Flow Rate	2.569	MGD	0.801	MGD	365
Temperature (Winter)	19.9	°C	15.1	NA	151
Temperature (Summer)	29.4	°C	24.1	NA	214

Pollutant	Maximum Daily Discharge		Average Daily Discharge			QL
	Conc.	Units	Conc.	Units	No. Samples	
BOD ₅	26.1	mg/L	3.58	mg/l	156	5.0
<i>E. coli</i>	17600	N/100 mL	56	N/100 ml	261	1/100 mL
TSS	11.1	mg/L	7.3	mg/l	12	2.0 mg/L
Ammonia (as N)	<QL	mg/L	<QL	mg/L	3	0.10
TRC	<QL	mg/L	<QL	mg/L	3	0.10
Dissolved Oxygen	12.1	mg/L	9.4	mg/L	365	+/- 0.03 mg/L
TKN	5.23	mg/L	3.09	mg/L	3	0.50
Nitrate + Nitrite Nitrogen	8.79	mg/L	6.21	mg/L	3	0.05
Oil and Grease	5.0	mg/L	1.67	mg/L	3	5.0
Total Phosphorus	3.05	mg/L	1.96	mg/L	3	0.10
Total Dissolved Solids (TDS)	1250	mg/L	897	mg/L	3	10

Note: The high maximum *E. coli* count is due to an upset that occurred at the plant during the fourth quarter of 2011. Please refer to the Site Inspection Report and the Compliance Inspection Report in **Attachment D** for specific details regarding the upset. The facility was issued a NOV for the limitation violations on 12/8/2011 and has since come back into compliance with the permit. The December 2011 NOV is the only enforcement action that the facility has received during the course of the 2007 permit term.

There are no aquatic life criteria for total dissolved solids. There is a human health (public water supply) criterion to maintain acceptable taste, odor, and aesthetic quality of drinking water that applies at the drinking water intake. This criterion of 500,000 mg/L far exceeds the TDS concentration reported on the application.

The facility is not located in the Chesapeake Bay watershed and is therefore not required to register for coverage under the General VPDES Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia. Further evaluation of nutrients phosphorus and nitrogen is not warranted.

ATTACHMENT A
DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER QUALITY CRITERIA MONITORING

CASRN#	CHEMICAL	EPA ANALYSIS NO.	QUANTIFICATION LEVEL ⁽¹⁾	REPORTING RESULTS	SAMPLE TYPE ⁽²⁾	SAMPLE FREQUENCY
METALS						
7440-36-0	Antimony, dissolved	(3)	1.4	0.60 ug/l	G or C	1/5 YR
7440-38-2	Arsenic, dissolved	(3)	1.0	0.69 ug/l	G or C	1/5 YR
7440-43-9	Cadmium, dissolved	(3)	0.3	0.33 ug/l	G or C	1/5 YR
16065-83-1	Chromium III, dissolved ⁽⁸⁾	(3)	3.6	0.50 ug/l	G or C	1/5 YR
18540-29-9	Chromium VI, dissolved ⁽⁸⁾	(3)	1.6	0.50 ug/l	G or C	1/5 YR
7440-50-8	Copper, dissolved	(3)	0.50	5.6 ug/l	G or C	1/5 YR
7439-92-1	Lead, dissolved	(3)	0.50	0.50 ug/l	G or C	1/5 YR
7439-97-6	Mercury, dissolved	(3)	1.0	N/D	G or C	1/5 YR
7440-02-0	Nickel, dissolved	(3)	0.94	2.3 ug/l	G or C	1/5 YR
7782-49-2	Selenium, Total Recoverable	(3)	2.0	< 5.0 ug/l	G or C	1/5 YR
7440-22-4	Silver, dissolved	(3)	0.20	< 0.5 ug/l	G or C	1/5 YR
7440-28-0	Thallium, dissolved	(4)	(5)	< 0.10 ug/l	G or C	1/5 YR
7440-66-6	Zinc, dissolved	(3)	3.6	47.0 ug/l	G or C	1/5 YR
PESTICIDES/PCB'S						
309-00-2	Aldrin	608	0.05	< .005 ug/l	G or C	1/5 YR
57-74-9	Chlordane	608	0.2	< 0.2 ug/l	G or C	1/5 YR
2921-88-2	Chlorpyrifos (synonym = Dursban)	(4)	(5)	< 0.2 ug/l	G or C	1/5 YR
72-54-8	DDD	608	0.1	< 0.1 ug/l	G or C	1/5 YR
72-55-9	DDE	608	0.1	< QL	G or C	1/5 YR
50-29-3	DDT	608	0.1	< 0.1 ug/l	G or C	1/5 YR
8065-48-3	Demeton	(4)	(5)	< 1.0 ug/l	G or C	1/5 YR
333-41-5	Diazinon	(4)	(5)	< 1.0 ug/l	G or C	1/5 YR
60-57-1	Dieldrin	608	0.1	< .005 ug/l	G or C	1/5 YR
959-98-8	Alpha-Endosulfan	608	0.1	< 0.1 ug/l	G or C	1/5 YR
33213-65-9	Beta-Endosulfan	608	0.1	< .04 ug/l	G or C	1/5 YR
1031-07-8	Endosulfan Sulfate	608	0.1	< .01 ug/l	G or C	1/5 YR

CASRN#	CHEMICAL	EPA ANALYSIS NO.	QUANTIFICATION LEVEL ⁽¹⁾	REPORTING RESULTS	SAMPLE TYPE ⁽²⁾	SAMPLE FREQUENCY
72-20-8	Endrin	608	0.1	< 0.1 ug/l	G or C	1/5 YR
7421-93-4	Endrin Aldehyde	(4)	(5)	< 0.2 ug/l	G or C	1/5 YR
86-50-0	Guthion	(4)	(5)	< 1.0 ug/l	G or C	1/5 YR
76-44-8	Heptachlor	608	0.05	< 0.05 ug/l	G or C	1/5 YR
1024-57-3	Heptachlor Epoxide	(4)	(5)	< 0.2 ug/l	G or C	1/5 YR
319-84-6	Hexachlorocyclohexane Alpha-BHC	608	(5)	< 0.02 ug/l	G or C	1/5 YR
319-85-7	Hexachlorocyclohexane Beta-BHC	608	(5)	< 0.05 ug/l	G or C	1/5 YR
58-89-9	Hexachlorocyclohexane Gamma-BHC or Lindane	608	(5)	< 0.02 ug/l	G or C	1/5 YR
143-50-0	Kepone	(9)	(5)	ND ug/l	G or C	1/5 YR
121-75-5	Malathion	(4)	(5)	< 1.0 ug/l	G or C	1/5 YR
72-43-5	Methoxychlor	(4)	(5)	< 2.0 ug/l	G or C	1/5 YR
2385-85-5	Mirex	(4)	(5)	< 0.1 ug/l	G or C	1/5 YR
56-38-2	Parathion	(4)	(5)	< 1.0 ug/l	G or C	1/5 YR
1336-36-3	PCB Total	608	7.0	< 7.0 ug/l	G or C	1/5 YR
8001-35-2	Toxaphene	608	5.0	< 3.0 ug/l	G or C	1/5 YR

BASE NEUTRAL EXTRACTABLES

83-32-9	Acenaphthene	625	10.0	< 5.0 ug/l	G or C	< 5.0 ug/l 1/5 YR
120-12-7	Anthracene	625	10.0	< 5.0 ug/l	G or C	1/5 YR
92-87-5	Benzidine	(4)	(5)	< 5.0 ug/l	G or C	1/5 YR
56-55-3	Benzo (a) anthracene	625	10.0	< 5.0 ug/l	G or C	1/5 YR
205-99-2	Benzo (b) fluoranthene	625	10.0	< 5.0 ug/l	G or C	1/5 YR
207-08-9	Benzo (k) fluoranthene	625	10.0	< 5.0 ug/l	G or C	1/5 YR
50-32-8	Benzo (a) pyrene	625	10.0	< 5.0 ug/l	G or C	1/5 YR
111-44-4	Bis 2-Chloroethyl Ether	(4)	(5)	< 5.0 ug/l	G or C	1/5 YR
108-60-1	Bis 2-Chloroisopropyl Ether	(4)	(5)	< 5.0 ug/l	G or C	1/5 YR
85-68-7	Butyl benzyl phthalate	625	10.0	< 5.0 ug/l	G or C	1/5 YR
91-58-7	2-Chloronaphthalene	(4)	(5)	< 5.0 ug/l	G or C	1/5 YR
218-01-9	Chrysene	625	10.0	< 5.0 ug/l	G or C	1/5 YR
53-70-3	Dibenz(a,h)anthracene	625	20.0	< 5.0 ug/l	G or C	1/5 YR

CASRN#	CHEMICAL	EPA ANALYSIS NO.	QUANTIFICATION LEVEL ⁽¹⁾	REPORTING RESULTS	SAMPLE TYPE ⁽²⁾	SAMPLE FREQUENCY
84-74-2	Dibutyl phthalate (synonym = Di-n-Butyl Phthalate)	625	10.0	< 5.0 ug/l	G or C	1/5 YR
95-50-1	1,2-Dichlorobenzene	624	10.0	ND	G or C	1/5 YR
541-73-1	1,3-Dichlorobenzene	624	10.0	ND	G or C	1/5 YR
106-46-7	1,4-Dichlorobenzene	624	10.0	ND	G or C	1/5 YR
91-94-1	3,3-Dichlorobenzidine	(4)	(5)	< 5.0 ug/l	G or C	1/5 YR
84-66-2	Diethyl phthalate	625	10.0	< 5.0 ug/l	G or C	1/5 YR
117-81-7	Bis-2-ethylhexyl phthalate	625	10.0	< 5.0 ug/l	G or C	1/5 YR
131-11-3	Dimethyl phthalate	(4)	(5)	< 5.0 ug/l	G or C	1/5 YR
121-14-2	2,4-Dinitrotoluene	625	10.0	< 5.0 ug/l	G or C	1/5 YR
122-66-7	1,2-Diphenylhydrazine	(4)	(5)	< 5.0 ug/l	G or C	1/5 YR
206-44-0	Fluoranthene	625	10.0	< 5.0 ug/l	G or C	1/5 YR
86-73-7	Fluorene	625	10.0	< 5.0 ug/l	G or C	1/5 YR
118-74-1	Hexachlorobenzene	(4)	(5)	< 5.0 ug/l	G or C	1/5 YR
87-68-3	Hexachlorobutadiene	(4)	(5)	< 5.0 ug/l	G or C	1/5 YR
77-47-4	Hexachlorocyclopentadiene	(4)	(5)	< 5.0 ug/l	G or C	1/5 YR
67-72-1	Hexachloroethane	(4)	(5)	< 5.0 ug/l	G or C	1/5 YR
193-39-5	Indeno(1,2,3-cd)pyrene	625	20.0	< 5.0 ug/l	G or C	1/5 YR
78-59-1	Isophorone	625	10.0	< 5.0 ug/l	G or C	1/5 YR
98-95-3	Nitrobenzene	625	10.0	< 5.0 ug/l	G or C	1/5 YR
62-75-9	N-Nitrosodimethylamine	(4)	(5)	< 5.0 ug/l	G or C	1/5 YR
621-64-7	N-Nitrosodi-n-propylamine	(4)	(5)	< 5.0 ug/l	G or C	1/5 YR
86-30-6	N-Nitrosodiphenylamine	(4)	(5)	< 5.0 ug/l	G or C	1/5 YR
129-00-0	Pyrene	625	10.0	< 5.0 ug/l	G or C	1/5 YR
120-82-1	1,2,4-Trichlorobenzene	625	10.0	< 5.0 ug/l	G or C	1/5 YR
VOLATILES						
107-02-8	Acrolein	(4)	(5)	ND	G	1/5 YR
107-13-1	Acrylonitrile	(4)	(5)	ND	G	1/5 YR
71-43-2	Benzene	624	10.0	ND	G	1/5 YR
75-25-2	Bromoform	624	10.0	ND	G	1/5 YR

CASRN#	CHEMICAL	EPA ANALYSIS NO.	QUANTIFICATION LEVEL ⁽¹⁾	REPORTING RESULTS	SAMPLE TYPE ⁽²⁾	SAMPLE FREQUENCY
56-23-5	Carbon Tetrachloride	624	10.0	ND	G	1/5 YR
108-90-7	Chlorobenzene (synonym = monochlorobenzene)	624	50.0	ND	G	1/5 YR
124-48-1	Chlorodibromomethane	624	10.0	ND	G	1/5 YR
67-66-3	Chloroform	624	10.0	ND	G	1/5 YR
75-09-2	Dichloromethane (synonym = methylene chloride)	624	20.0	ND	G	1/5 YR
75-27-4	Dichlorobromomethane	624	10.0	ND	G	1/5 YR
107-06-2	1,2-Dichloroethane	624	10.0	ND	G	1/5 YR
75-35-4	1,1-Dichloroethylene	624	10.0	ND	G	1/5 YR
156-60-5	1,2-trans-dichloroethylene	(4)	(5)	ND	G	1/5 YR
78-87-5	1,2-Dichloropropane	(4)	(5)	ND	G	1/5 YR
542-75-6	1,3-Dichloropropene	(4)	(5)	ND	G	1/5 YR
100-41-4	Ethylbenzene	624	10.0	ND	G	1/5 YR
74-83-9	Methyl Bromide	(4)	(5)	ND	G	1/5 YR
79-34-5	1,1,1,2-Tetrachloroethane	(4)	(5)	ND	G	1/5 YR
127-18-4	Tetrachloroethylene	624	10.0	ND	G	1/5 YR
10-88-3	Toluene	624	10.0	ND	G	1/5 YR
79-00-5	1,1,2-Trichloroethane	(4)	(5)	ND	G	1/5 YR
79-01-6	Trichloroethylene	624	10.0	ND	G	1/5 YR
75-01-4	Vinyl Chloride	624	10.0	ND	G	1/5 YR

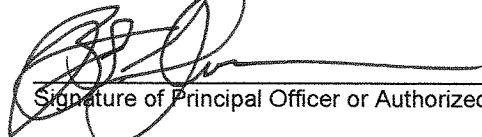
ACID EXTRACTABLES ⁽⁶⁾

95-57-8	2-Chlorophenol	625	10.0	< 5.0 ug/l	G or C	1/5 YR
120-83-2	2,4 Dichlorophenol	625	10.0	< 5.0 ug/l	G or C	1/5 YR
105-67-9	2,4 Dimethylphenol	625	10.0	< 5.0 ug/l	G or C	1/5 YR
51-28-5	2,4-Dinitrophenol	(4)	(5)	< 20.0 ug/l	G or C	1/5 YR
534-52-1	2-Methyl-4,6-Dinitrophenol	(4)	(5)	< 5.0 ug/l	G or C	1/5 YR
25154-52-3	Nonylphenol	(5)	(5)	< 5.0 ug/l	G or C	1/5 YR
87-86-5	Pentachlorophenol	625	50.0	< 10.0 ug/l	G or C	1/5 YR
108-95-2	Phenol	625	10.0	< 5.0 ug/l	G or C	1/5 YR
88-06-2	2,4,6-Trichlorophenol	625	10.0	< 5.0 ug/l	G or C	1/5 YR

CASRN#	CHEMICAL	EPA ANALYSIS NO.	QUANTIFICATION LEVEL ⁽¹⁾	REPORTING RESULTS	SAMPLE TYPE ⁽²⁾	SAMPLE FREQUENCY
MISCELLANEOUS						
776-41-7	Ammonia as NH3-N	350.1	200	0.10 mg/l	C	1/5 YR
16887-00-6	Chlorides	(4)	(5)	67.9 mg/l	C	1/5 YR
7782-50-5	Chlorine, Total Residual	(4)	100	< 0.10 mg/l	G	1/5 YR
57-12-5	Cyanide, Free	(4)	10.0	< 5.0 ug/l	G	1/5 YR
N/A	<i>E. coli</i> / <i>Enterococcus</i> (N/CML)	(4)	(5)	22 N/CML	G	1/5 YR
7783-06-4	Hydrogen Sulfide	(5)	(5)	< 20.0 ug/l	G	1/5 YR
60-10-5	Tributyltin ⁽⁷⁾	NBSR 85-3295	(5)	ND	G or C	1/5 YR
	Hardness (mg/L as CaCO ₃)	(4)	(5)	101 mg/l	G or C (10)	1/5 YR

Brian S. Thrower, City Manager

Name of Principal Exec. Officer or Authorized Agent/Title

 2/7/12
Signature of Principal Officer or Authorized Agent/Date

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment for knowing violations. See 18 U.S.C. Sec. 1001 and 33 U.S.C. Sec. 1319. (Penalties under these statutes may include fines up to \$10,000 and or maximum imprisonment of between 6 months and 5 years.)

FOOTNOTES:

- (1) Quantification level (QL) is defined as the lowest concentration used for the calibration of a measurement system when the calibration is in accordance with the procedures published for the required method.

The quantification levels indicated for the metals are actually Specific Target Values developed for this permit. The Specific Target Value is the approximate value that may initiate a wasteload allocation analysis. Target values are not wasteload allocations or effluent limitations. The Specific Target Values are subject to change based on additional information such as hardness data, receiving stream flow, and design flows.

Units for the quantification level are micrograms/liter unless otherwise specified.

Quality control and quality assurance information shall be submitted to document that the required quantification level has been attained.

- (2) Sample Type

G = Grab = An individual sample collected in less than 15 minutes. Substances specified with "grab" sample type shall only be collected as grabs. The permittee may analyze multiple grabs and report

the average results provided that the individual grab results are also reported. For grab metals samples, the individual samples shall be filtered and preserved immediately upon collection.

C = Composite = A 24-hour (**PW - Revise as required to require same composite duration as BOD₅**) composite unless otherwise specified. The composite shall be a combination of individual samples, taken proportional to flow, obtained at hourly or smaller time intervals. The individual samples may be of equal volume for flows that do not vary by +/- 10 percent over a 24-hour period.

- (3) A specific analytical method is not specified; however a target value for each metal has been established. An appropriate method to meet the target value shall be selected from the following list of EPA methods (or any approved method presented in 40 CFR Part 136). If the test result is less than the method QL, a "<[QL]" shall be reported where the actual analytical test QL is substituted for [QL].

<u>Metal</u>	<u>Analytical Method</u>
Antimony	1638; 1639
Arsenic	1632
Chromium ⁽⁸⁾	1639
Cadmium	1637; 1638; 1639; 1640
Chromium VI	1639
Copper	1638; 1640
Lead	1637; 1638; 1640
Mercury	1631
Nickel	1638; 1639; 1640
Selenium	1638; 1639
Silver	1638
Zinc	1638; 1639

- (4) Any approved method presented in 40 CFR Part 136.
- (5) The QL is at the discretion of the permittee. For any substances addressed in 40 CFR Part 136, the permittee shall use one of the approved methods in 40 CFR Part 136.
- (6) Testing for phenols requires continuous extraction.
- (7) Analytical Methods: NBSR 85-3295 or DEQ's approved analysis for Tributyltin may also be used [See A Manual for the Analysis of Butyltins in Environmental Systems by the Virginia Institute of Marine Science, dated November 1996].
- (8) Both Chromium III and Chromium VI may be measured by the total chromium analysis. If the result of the total chromium analysis is less than or equal to the lesser of the Chromium III or Chromium VI method QL, the results for both Chromium III and Chromium VI can be reported as "<[QL]", where the actual analytical test QL is substituted for [QL].
- (9) The lab may use SW846 Method 8270D provided the lab has an Initial Demonstration of Capability, has passed a PT for Kepone, and meets the acceptance criteria for Kepone as given in Method 8270D
- (10) The sample type for Hardness (as CaCO₃) shall match the sample type selected for Dissolved Metals.

Table 1. Flow DMR data

Monthly Average (MGD)	Maximum (MGD)	DMR due date
0.796	1.148	10-Jul-07
0.701	0.813	10-Aug-07
0.870	1.275	10-Sep-07
0.748	0.930	10-Oct-07
0.832	1.806	10-Nov-07
0.652	0.762	10-Dec-07
0.711	1.010	10-Jan-08
0.863	1.310	10-Feb-08
0.896	1.370	10-Mar-08
0.977	1.266	10-Apr-08
1.121	1.601	10-May-08
0.965	1.388	10-Jun-08
0.849	0.970	10-Jul-08
0.872	1.290	10-Aug-08
0.734	0.881	10-Sep-08
0.791	1.191	10-Oct-08
0.679	0.846	10-Nov-08
0.711	1.006	10-Dec-08
0.845	1.231	10-Jan-09
0.848	1.113	10-Feb-09
0.757	0.909	10-Mar-09
1.082	1.440	10-Apr-09
1.040	1.405	10-May-09
1.065	1.395	10-Jun-09
1.163	1.697	10-Jul-09
0.975	1.490	10-Aug-09
0.868	1.262	10-Sep-09
0.849	1.148	10-Oct-09
0.695	0.875	10-Nov-09
0.916	1.205	10-Dec-09
1.395	1.982	10-Jan-10
1.308	1.801	10-Feb-10
1.515	1.912	10-Mar-10
1.169	1.667	10-Apr-10
1.061	1.934	10-May-10
1.074	1.953	10-Jun-10
0.952	1.192	10-Jul-10
0.806	1.023	10-Aug-10
0.662	0.862	10-Sep-10
0.723	1.767	10-Oct-10
0.835	1.849	10-Nov-10
0.643	0.785	10-Dec-10
0.774	1.124	10-Jan-11
0.771	1.070	10-Feb-11
0.805	1.108	10-Mar-11
0.888	1.478	10-Apr-11
0.916	1.174	10-May-11
0.822	0.990	10-Jun-11
0.720	0.777	10-Jul-11
0.766	1.166	10-Aug-11

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Table 2. pH DMR data

Minimum (SU)	Maximum (SU)	DMR due date
6.71	7.80	10-Jul-07
7.15	7.58	10-Aug-07
7.25	7.70	10-Sep-07
7.32	7.72	10-Oct-07
7.20	7.71	10-Nov-07
7.38	7.92	10-Dec-07
7.00	7.87	10-Jan-08
6.88	7.61	10-Feb-08
6.87	7.60	10-Mar-08
6.72	7.44	10-Apr-08
7.00	7.56	10-May-08
6.91	7.77	10-Jun-08
7.05	7.76	10-Jul-08
6.98	7.84	10-Aug-08
7.15	7.75	10-Sep-08
7.00	7.58	10-Oct-08
7.16	7.56	10-Nov-08
7.08	7.55	10-Dec-08
6.42	7.44	10-Jan-09
6.77	7.43	10-Feb-09
7.15	7.61	10-Mar-09
6.97	7.46	10-Apr-09
6.97	7.36	10-May-09
7.00	7.48	10-Jun-09
6.69	7.44	10-Jul-09
6.89	7.60	10-Aug-09
7.11	7.64	10-Sep-09
7.20	7.69	10-Oct-09
7.15	7.63	10-Nov-09
7.05	7.72	10-Dec-09
6.51	7.46	10-Jan-10
6.62	7.28	10-Feb-10
6.57	7.30	10-Mar-10
6.85	7.56	10-Apr-10
6.75	7.44	10-May-10
6.78	7.48	10-Jun-10
7.15	7.61	10-Jul-10
6.89	7.64	10-Aug-10
7.15	7.72	10-Sep-10
6.99	7.54	10-Oct-10
6.85	7.74	10-Nov-10
7.08	7.63	10-Dec-10
6.93	7.65	10-Jan-11
7.03	7.45	10-Feb-11
7.02	7.27	10-Mar-11
6.82	7.33	10-Apr-11
6.68	7.30	10-May-11
7.08	7.80	10-Jun-11
7.25	7.77	10-Jul-11
7.17	7.66	10-Aug-11
	90 th percentile max: 7.77	10 th percentile max: 7.36

Table 3. BOD₅ DMR data

Monthly Average (mg/L)	Monthly Average (kg/d)	Weekly Average (mg/L)	Monthly Average (kg/d)	DMR due date
7.72	22.75	10.60	30.09	10-Jul-07
8.09	20.79	8.59	23.97	10-Aug-07
4.84	16.21	7.83	28.66	10-Sep-07
4.79	13.22	6.68	18.36	10-Oct-07
1.36	4.29	2.48	8.23	10-Nov-07
2.53	6.06	2.20	5.13	10-Dec-07
2.79	7.08	4.94	13.02	10-Jan-08
>25.99	>84.78	>38.78	>122.08	10-Feb-08
5	16	9	32	10-Mar-08
5	22	18	78	10-Apr-08
2.5	10	5.0	19	10-May-08
1.2	6	5.2	24	10-Jun-08
0.4	2	1.9	7	10-Jul-08
<QL	<QL	<QL	<QL	10-Aug-08
0.9	3	2.2	7	10-Sep-08
0.5	1	<QL	<QL	10-Oct-08
1.1	3	2.6	7	10-Nov-08
<QL	<QL	<QL	<QL	10-Dec-08
0.8	2	1.8	8	10-Jan-09
1.0	3	2.1	5	10-Feb-09
1.1	3	3.8	11	10-Mar-09
5.4	20	7.5	32	10-Apr-09
4.0	16	8.1	29	10-May-09
1.6	7	2.6	11	10-Jun-09
1.6	6	<QL	<QL	10-Jul-09
3.1	11	2.1	7	10-Aug-09
1.8	5	5.3	16	10-Sep-09
0.7	2	3.4	10	10-Oct-09
<QL	<QL	<QL	<QL	10-Nov-09
<QL	<QL	<QL	<QL	10-Dec-09
2.8	15	4.8	28	10-Jan-10
<QL	<QL	<QL	<QL	10-Feb-10
8.7	55	30.2	196	10-Mar-10
4.0	19	3.5	15	10-Apr-10
0.7	5	<QL	<QL	10-May-10
<QL	<QL	<QL	<QL	10-Jun-10
0.4	1	1.9	6	10-Jul-10
0.5	2	2.3	8	10-Aug-10
<QL	<QL	<QL	<QL	10-Sep-10
0.8	2	2.0	5	10-Oct-10
2.7	9.0	6.3	24	10-Nov-10
0.9	2.3	1.9	4.4	10-Dec-10
4.1	13.0	<QL	<QL	10-Jan-11
1.1	3.2	2.6	7.6	10-Feb-11
<QL	<QL	<QL	<QL	10-Mar-11
1.4	4.0	3.7	10	10-Apr-11
2.4	8.8	9.6	35	10-May-11
<QL	<QL	<QL	<QL	10-Jun-11

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<QL	<QL	<QL	<QL	10-Jul-11
0.5	1.1	1.8	4.5	10-Aug-11

Table 4. TSS DMR data

Monthly Average (mg/L)	Monthly Average (kg/d)	Weekly Average (mg/L)	Monthly Average (kg/d)	DMR due date
15.04	42.49	9.89	28.48	10-Jul-07
7.42	17.99	7.42	17.99	10-Aug-07
5.60	15.43	5.60	15.43	10-Sep-07
5.35	12.43	5.35	12.43	10-Oct-07
4.50	14.07	3.20	10.36	10-Nov-07
4.80	9.41	4.80	9.41	10-Dec-07
11.50	29.73	11.50	29.73	10-Jan-08
5.75	18.28	5.75	18.28	10-Feb-08
9	33	9	33	10-Mar-08
2.2	6.2	2.2	6.2	10-Apr-08
7.4	42	7.4	42	10-May-08
2.9	10	2.9	10	10-Jun-08
6.4	22	6.4	22	10-Jul-08
5.1	22	5.1	22	10-Aug-08
4.0	12	4.0	12	10-Sep-08
8.1	24	8.1	24	10-Oct-08
14.1	36	14.1	36	10-Nov-08
3.9	9	3.9	9	10-Dec-08
26	74	26	74	10-Jan-09
16	34	16	34	10-Feb-09
2.8	8	2.8	8	10-Mar-09
12.8	52	12.8	52	10-Apr-09
11.0	44	11.0	44	10-May-09
10	43	10	43	10-Jun-09
14	79	14	79	10-Jul-09
14	46	14	46	10-Aug-09
13	45	13	45	10-Sep-09
5.9	19	5.9	19	10-Oct-09
8.8	24	8.8	24	10-Nov-09
10	30	10	30	10-Dec-09
6.7	27	6.7	27	10-Jan-10
6.4	27	6.4	27	10-Feb-10
4.5	23	4.5	23	10-Mar-10
11	42	11	42	10-Apr-10
6.8	25	6.8	25	10-May-10
5.2	17	5.2	17	10-Jun-10
4.6	18	4.6	18	10-Jul-10
4.2	13	4.2	13	10-Aug-10
5.5	14	5.5	14	10-Sep-10
11	27	11	27	10-Oct-10
9.4	27	9.4	27	10-Nov-10
9.0	25	9.0	25	10-Dec-10
9.6	22	9.6	22	10-Jan-11
4.4	14	4.4	14	10-Feb-11
8.8	29	8.8	29	10-Mar-11

Monthly Average (mg/L)	Monthly Average (kg/d)	Weekly Average (mg/L)	Monthly Average (kg/d)	DMR due date
8.6	36	8.5	31	10-Apr-11
11	31	11	31	10-May-11
7.2	22	7.2	22	10-Jun-11
8.0	22	8.0	22	10-Jul-11
2.9	9	2.9	9	10-Aug-11

Table 5. Dissolved Oxygen and *E. coli* DMR data

DO minimum (mg/L)	<i>E. coli</i> count (N/100mL)	DMR due date
7.0	200	10-Jul-07
6.6	117	10-Aug-07
6.8	46	10-Sep-07
6.7	49	10-Oct-07
7.0	65	10-Nov-07
8.0	26	10-Dec-07
8.8	24	10-Jan-08
9.4	489	10-Feb-08
8.4	49	10-Mar-08
8.6	17	10-Apr-08
8.4	71	10-May-08
7.6	62	10-Jun-08
6.9	75	10-Jul-08
6.8	18	10-Aug-08
6.8	34	10-Sep-08
6.8	31	10-Oct-08
7.6	21	10-Nov-08
8.2	42	10-Dec-08
7.5	51	10-Jan-09
8.2	16	10-Feb-09
9.5	16	10-Mar-09
6.8	22	10-Apr-09
8.1	36	10-May-09
7.6	54	10-Jun-09
7.2	36	10-Jul-09
6.9	33	10-Aug-09
6.8	30	10-Sep-09
6.4	24	10-Oct-09
7.7	30	10-Nov-09
6.8	37	10-Dec-09
8.9	33	10-Jan-10
9.4	27	10-Feb-10
9.8	63	10-Mar-10
9.2	92	10-Apr-10
8.0	38	10-May-10
7.8	39	10-Jun-10
7.0	61	10-Jul-10
6.6	61	10-Aug-10
6.8	92	10-Sep-10
6.8	148	10-Oct-10
6.8	34	10-Nov-10

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DO minimum (mg/L)	<i>E. coli</i> count (N/100mL)	DMR due date
8.1	17	10-Dec-10
8.9	43	10-Jan-11
9.6	4	10-Feb-11
8.4	26	10-Mar-11
9.0	34	10-Apr-11
6.2	36	10-May-11
6.2	57	10-Jun-11
7.0	29	10-Jul-11
7.0	52	10-Aug-11

**Attachment G: Mix.exe, MSTRANTI data source report,
MSTRANTI**

Mixing Zone Predictions for Emporia WWTP

Effluent Flow = 1.5 MGD
Stream 7Q10 = 12 MGD
Stream 30Q10 = 18 MGD
Stream 1Q10 = 4.9 MGD
Stream slope = .00054 ft/ft
Stream width = 34 ft
Bottom scale = 2
Channel scale = 1

Mixing Zone Predictions @ 7Q10

Depth = 1.2703 ft
Length = 1185.07 ft
Velocity = .4838 ft/sec
Residence Time = .0283 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 7Q10 may be used.

Mixing Zone Predictions @ 30Q10

Depth = 1.5951 ft
Length = 968.84 ft
Velocity = .5566 ft/sec
Residence Time = .0201 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 30Q10 may be used.

Mixing Zone Predictions @ 1Q10

Depth = .8034 ft
Length = 1766.23 ft
Velocity = .3627 ft/sec
Residence Time = 1.3527 hours

Recommendation:

A complete mix assumption is appropriate for this situation providing no more than 73.93% of the 1Q10 is used.

MSTRANTI DATA SOURCE REPORT

Stream information	
Mean Hardness	Ambient Stream Station 5AMHN052.34
90% Temperature (annual)	
90% Maximum pH	
10% Maximum pH	
Tier Designation	Tier Determination (Tier 1)
Stream Flows	
All Data	Flow Frequency Determination (Attachment A)
Mixing Information	
All Data	Mix.exe
Effluent Information	
Mean Hardness	Permit application (Attachment A)
90 th percentile Temperature (annual)	Calculated from 2009-2011 effluent data (27°C)
90% Maximum pH	Calculated from DMR data
10% Maximum pH	Calculated from DMR data
Discharge flow	Design Flow (1.5 MGD)

Data Location:

Flow Frequency Memo (Stream Information) – Attachment A
DMR and effluent data- Attachment F

FRESHWATER WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: **Emporia WWTP**

Permit No.: **VA0020346**

Receiving Stream: **Meherrin River**

Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information		Stream Flows		Mixing Information		Effluent Information	
Mean Hardness (as CaCO3) =	26 mg/L	1Q10 (Annual) =	4.9 MGD	Annual - 1Q10 Mix =	73.93 %	Mean Hardness (as CaCO3) =	101 mg/L
90% Temperature (Annual) =	26.1 deg C	7Q10 (Annual) =	12 MGD	- 7Q10 Mix =	100 %	90% Temp (Annual) =	27 deg C
90% Temperature (Wet season) =	deg C	30Q10 (Annual) =	18 MGD	- 30Q10 Mix =	100 %	90% Temp (Wet season) =	deg C
90% Maximum pH =	7.5 SU	1Q10 (Wet season) =	64 MGD	Wet Season - 1Q10 Mix =	%	90% Maximum pH =	7.77 SU
10% Maximum pH =	6.4 SU	30Q10 (Wet season) =	164 MGD	- 30Q10 Mix =	%	10% Maximum pH =	7.36 SU
Tier Designation (1 or 2) =	1	30Q5 =	26 MGD			Discharge Flow =	1.5 MGD
Public Water Supply (PWS) Y/N? =	n	Harmonic Mean =	93.1 MGD				
Trout Present Y/N? =	n						
Early Life Stages Present Y/N? =	y						

Parameter (ug/l unless noted)	Background Conc.	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
		Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Acenaphthene	5	--	--	na	9.9E+02	--	--	na	1.8E+04	--	--	--	--	--	--	--	--	--	--	na	1.8E+04
Acrolein	0	--	--	na	9.3E+00	--	--	na	1.7E+02	--	--	--	--	--	--	--	--	--	--	na	1.7E+02
Acrylonitrile ^C	0	--	--	na	2.5E+00	--	--	na	1.6E+02	--	--	--	--	--	--	--	--	--	--	na	1.6E+02
Aldrin ^C	0	3.0E+00	--	na	5.0E-04	1.0E+01	--	na	3.2E-02	--	--	--	--	--	--	--	--	1.0E+01	--	na	3.2E-02
Ammonia-N (mg/l) (Yearly)	0	1.81E+01	2.03E+00	na	--	6.17E+01	2.64E+01	na	--	--	--	--	--	--	--	--	--	6.17E+01	2.64E+01	na	--
Ammonia-N (mg/l) (High Flow)	0	1.28E+01	3.30E+00	na	--	1.28E+01	3.30E+00	na	--	--	--	--	--	--	--	--	--	1.28E+01	3.30E+00	na	--
Anthracene	0	--	--	na	4.0E+04	--	--	na	7.3E+05	--	--	--	--	--	--	--	--	--	--	na	7.3E+05
Antimony	0	--	--	na	6.4E+02	--	--	na	1.2E+04	--	--	--	--	--	--	--	--	--	--	na	1.2E+04
Arsenic	0	3.4E+02	1.5E+02	na	--	1.2E+03	1.4E+03	na	--	--	--	--	--	--	--	--	--	1.2E+03	1.4E+03	na	--
Barium	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Benzene ^C	0	--	--	na	5.1E+02	--	--	na	3.2E+04	--	--	--	--	--	--	--	--	--	--	na	3.2E+04
Benzidine ^C	0	--	--	na	2.0E-03	--	--	na	1.3E-01	--	--	--	--	--	--	--	--	--	--	na	1.3E-01
Benzo (a) anthracene ^C	0	--	--	na	1.8E-01	--	--	na	1.1E+01	--	--	--	--	--	--	--	--	--	--	na	1.1E+01
Benzo (b) fluoranthene ^C	0	--	--	na	1.8E-01	--	--	na	1.1E+01	--	--	--	--	--	--	--	--	--	--	na	1.1E+01
Benzo (k) fluoranthene ^C	0	--	--	na	1.8E-01	--	--	na	1.1E+01	--	--	--	--	--	--	--	--	--	--	na	1.1E+01
Benzo (a) pyrene ^C	0	--	--	na	1.8E-01	--	--	na	1.1E+01	--	--	--	--	--	--	--	--	--	--	na	1.1E+01
Bis2-Chloroethyl Ether ^C	0	--	--	na	5.3E+00	--	--	na	3.3E+02	--	--	--	--	--	--	--	--	--	--	na	3.3E+02
Bis2-Chloroisopropyl Ether	0	--	--	na	6.5E+04	--	--	na	1.2E+06	--	--	--	--	--	--	--	--	--	--	na	1.2E+06
Bis 2-Ethylhexyl Phthalate ^C	0	--	--	na	2.2E+01	--	--	na	1.4E+03	--	--	--	--	--	--	--	--	--	--	na	1.4E+03
Bromoform ^C	0	--	--	na	1.4E+03	--	--	na	8.8E+04	--	--	--	--	--	--	--	--	--	--	na	8.8E+04
Butylbenzylphthalate	0	--	--	na	1.9E+03	--	--	na	3.5E+04	--	--	--	--	--	--	--	--	--	--	na	3.5E+04
Cadmium	0	1.7E+00	4.9E-01	na	--	5.8E+00	4.4E+00	na	--	--	--	--	--	--	--	--	--	5.8E+00	4.4E+00	na	--
Carbon Tetrachloride ^C	0	--	--	na	1.6E+01	--	--	na	1.0E+03	--	--	--	--	--	--	--	--	--	--	na	1.0E+03
Chlordane ^C	0	2.4E+00	4.3E-03	na	8.1E-03	8.2E+00	3.9E-02	na	5.1E-01	--	--	--	--	--	--	--	--	8.2E+00	3.9E-02	na	5.1E-01
Chloride	0	8.6E+05	2.3E+05	na	--	2.9E+06	2.1E+06	na	--	--	--	--	--	--	--	--	--	2.9E+06	2.1E+06	na	--
TRC	0	1.9E+01	1.1E+01	na	--	6.5E+01	9.9E+01	na	--	--	--	--	--	--	--	--	--	6.5E+01	9.9E+01	na	--
Chlorobenzene	0	--	--	na	1.6E+03	--	--	na	2.9E+04	--	--	--	--	--	--	--	--	--	--	na	2.9E+04

Parameter (ug/l unless noted)	Background Conc.	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
		Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Chlorodibromomethane ^C	0	--	--	na	1.3E+02	--	--	na	8.2E+03	--	--	--	--	--	--	--	--	--	--	na	8.2E+03
Chloroform	0	--	--	na	1.1E+04	--	--	na	2.0E+05	--	--	--	--	--	--	--	--	--	--	na	2.0E+05
2-Chloronaphthalene	0	--	--	na	1.6E+03	--	--	na	2.9E+04	--	--	--	--	--	--	--	--	--	--	na	2.9E+04
2-Chlorophenol	0	--	--	na	1.5E+02	--	--	na	2.8E+03	--	--	--	--	--	--	--	--	--	--	na	2.8E+03
Chlorpyrifos	0	8.3E-02	4.1E-02	na	--	2.8E-01	3.7E-01	na	--	--	--	--	--	--	--	--	--	2.8E-01	3.7E-01	na	--
Chromium III	0	3.1E+02	3.1E+01	na	--	1.1E+03	2.8E+02	na	--	--	--	--	--	--	--	--	--	1.1E+03	2.8E+02	na	--
Chromium VI	0	1.6E+01	1.1E+01	na	--	5.5E+01	9.9E+01	na	--	--	--	--	--	--	--	--	--	5.5E+01	9.9E+01	na	--
Chromium, Total	0	--	--	1.0E+02	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Chrysene ^C	0	--	--	na	1.8E-02	--	--	na	1.1E+00	--	--	--	--	--	--	--	--	--	--	na	1.1E+00
Copper	0	6.7E+00	3.6E+00	na	--	2.3E+01	3.2E+01	na	--	--	--	--	--	--	--	--	--	2.3E+01	3.2E+01	na	--
Cyanide, Free	0	2.2E+01	5.2E+00	na	1.6E+04	7.5E+01	4.7E+01	na	2.9E+05	--	--	--	--	--	--	--	--	7.5E+01	4.7E+01	na	2.9E+05
DDD ^C	0	--	--	na	3.1E-03	--	--	na	2.0E-01	--	--	--	--	--	--	--	--	--	--	na	2.0E-01
DDE ^C	0	--	--	na	2.2E-03	--	--	na	1.4E-01	--	--	--	--	--	--	--	--	--	--	na	1.4E-01
DDT ^C	0	1.1E+00	1.0E-03	na	2.2E-03	3.8E+00	9.0E-03	na	1.4E-01	--	--	--	--	--	--	--	--	3.8E+00	9.0E-03	na	1.4E-01
Demeton	0	--	1.0E-01	na	--	--	9.0E-01	na	--	--	--	--	--	--	--	--	--	--	9.0E-01	na	--
Diazinon	0	1.7E-01	1.7E-01	na	--	5.8E-01	1.5E+00	na	--	--	--	--	--	--	--	--	--	5.8E-01	1.5E+00	na	--
Dibenz(a,h)anthracene ^C	0	--	--	na	1.8E-01	--	--	na	1.1E+01	--	--	--	--	--	--	--	--	--	--	na	1.1E+01
1,2-Dichlorobenzene	0	--	--	na	1.3E+03	--	--	na	2.4E+04	--	--	--	--	--	--	--	--	--	--	na	2.4E+04
1,3-Dichlorobenzene	0	--	--	na	9.6E+02	--	--	na	1.8E+04	--	--	--	--	--	--	--	--	--	--	na	1.8E+04
1,4-Dichlorobenzene	0	--	--	na	1.9E+02	--	--	na	3.5E+03	--	--	--	--	--	--	--	--	--	--	na	3.5E+03
3,3-Dichlorobenzidine ^C	0	--	--	na	2.8E-01	--	--	na	1.8E+01	--	--	--	--	--	--	--	--	--	--	na	1.8E+01
Dichlorobromomethane ^C	0	--	--	na	1.7E+02	--	--	na	1.1E+04	--	--	--	--	--	--	--	--	--	--	na	1.1E+04
1,2-Dichloroethane ^C	0	--	--	na	3.7E+02	--	--	na	2.3E+04	--	--	--	--	--	--	--	--	--	--	na	2.3E+04
1,1-Dichloroethylene	0	--	--	na	7.1E+03	--	--	na	1.3E+05	--	--	--	--	--	--	--	--	--	--	na	1.3E+05
1,2-trans-dichloroethylene	0	--	--	na	1.0E+04	--	--	na	1.8E+05	--	--	--	--	--	--	--	--	--	--	na	1.8E+05
2,4-Dichlorophenol	0	--	--	na	2.9E+02	--	--	na	5.3E+03	--	--	--	--	--	--	--	--	--	--	na	5.3E+03
2,4-Dichlorophenoxy acetic acid (2,4-D)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
1,2-Dichloropropane ^C	0	--	--	na	1.5E+02	--	--	na	9.5E+03	--	--	--	--	--	--	--	--	--	--	na	9.5E+03
1,3-Dichloropropene ^C	0	--	--	na	2.1E+02	--	--	na	1.3E+04	--	--	--	--	--	--	--	--	--	--	na	1.3E+04
Dieldrin ^C	0	2.4E-01	5.6E-02	na	5.4E-04	8.2E-01	5.0E-01	na	3.4E-02	--	--	--	--	--	--	--	--	8.2E-01	5.0E-01	na	3.4E-02
Diethyl Phthalate	0	--	--	na	4.4E+04	--	--	na	8.1E+05	--	--	--	--	--	--	--	--	--	--	na	8.1E+05
2,4-Dimethylphenol	0	--	--	na	8.5E+02	--	--	na	1.6E+04	--	--	--	--	--	--	--	--	--	--	na	1.6E+04
Dimethyl Phthalate	0	--	--	na	1.1E+06	--	--	na	2.0E+07	--	--	--	--	--	--	--	--	--	--	na	2.0E+07
Di-n-Butyl Phthalate	0	--	--	na	4.5E+03	--	--	na	8.3E+04	--	--	--	--	--	--	--	--	--	--	na	8.3E+04
2,4 Dinitrophenol	0	--	--	na	5.3E+03	--	--	na	9.7E+04	--	--	--	--	--	--	--	--	--	--	na	9.7E+04
2-Methyl-4,6-Dinitrophenol	0	--	--	na	2.8E+02	--	--	na	5.1E+03	--	--	--	--	--	--	--	--	--	--	na	5.1E+03
2,4-Dinitrotoluene ^C	0	--	--	na	3.4E+01	--	--	na	2.1E+03	--	--	--	--	--	--	--	--	--	--	na	2.1E+03
Dioxin 2,3,7,8- tetrachlorodibenzo-p-dioxin	0	--	--	na	5.1E-08	--	--	na	9.4E-07	--	--	--	--	--	--	--	--	--	--	na	9.4E-07
1,2-Diphenylhydrazine ^C	0	--	--	na	2.0E+00	--	--	na	1.3E+02	--	--	--	--	--	--	--	--	--	--	na	1.3E+02
Alpha-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	7.5E-01	5.0E-01	na	1.6E+03	--	--	--	--	--	--	--	--	7.5E-01	5.0E-01	na	1.6E+03
Beta-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	7.5E-01	5.0E-01	na	1.6E+03	--	--	--	--	--	--	--	--	7.5E-01	5.0E-01	na	1.6E+03
Alpha + Beta Endosulfan	0	2.2E-01	5.6E-02	--	--	7.5E-01	5.0E-01	--	--	--	--	--	--	--	--	--	--	7.5E-01	5.0E-01	--	--
Endosulfan Sulfate	0	--	--	na	8.9E+01	--	--	na	1.6E+03	--	--	--	--	--	--	--	--	--	--	na	1.6E+03
Endrin	0	8.6E-02	3.6E-02	na	6.0E-02	2.9E-01	3.2E-01	na	1.1E+00	--	--	--	--	--	--	--	--	2.9E-01	3.2E-01	na	1.1E+00
Endrin Aldehyde	0	--	--	na	3.0E-01	--	--	na	5.5E+00	--	--	--	--	--	--	--	--	--	--	na	5.5E+00

Parameter (ug/l unless noted)	Background Conc.	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
		Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Ethylbenzene	0	--	--	na	2.1E+03	--	--	na	3.9E+04	--	--	--	--	--	--	--	--	--	--	na	3.9E+04
Fluoranthene	0	--	--	na	1.4E+02	--	--	na	2.6E+03	--	--	--	--	--	--	--	--	--	--	na	2.6E+03
Fluorene	0	--	--	na	5.3E+03	--	--	na	9.7E+04	--	--	--	--	--	--	--	--	--	--	na	9.7E+04
Foaming Agents	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Guthion	0	--	1.0E-02	na	--	--	9.0E-02	na	--	--	--	--	--	--	--	--	--	--	9.0E-02	na	--
Heptachlor ^C	0	5.2E-01	3.8E-03	na	7.9E-04	1.8E+00	3.4E-02	na	5.0E-02	--	--	--	--	--	--	--	--	1.8E+00	3.4E-02	na	5.0E-02
Heptachlor Epoxide ^C	0	5.2E-01	3.8E-03	na	3.9E-04	1.8E+00	3.4E-02	na	2.5E-02	--	--	--	--	--	--	--	--	1.8E+00	3.4E-02	na	2.5E-02
Hexachlorobenzene ^C	0	--	--	na	2.9E-03	--	--	na	1.8E-01	--	--	--	--	--	--	--	--	--	--	na	1.8E-01
Hexachlorobutadiene ^C	0	--	--	na	1.8E+02	--	--	na	1.1E+04	--	--	--	--	--	--	--	--	--	--	na	1.1E+04
Hexachlorocyclohexane																					
Alpha-BHC ^C	0	--	--	na	4.9E-02	--	--	na	3.1E+00	--	--	--	--	--	--	--	--	--	--	na	3.1E+00
Hexachlorocyclohexane																					
Beta-BHC ^C	0	--	--	na	1.7E-01	--	--	na	1.1E+01	--	--	--	--	--	--	--	--	--	--	na	1.1E+01
Hexachlorocyclohexane																					
Gamma-BHC ^C (Lindane)	0	9.5E-01	na	na	1.8E+00	3.2E+00	--	na	1.1E+02	--	--	--	--	--	--	--	--	3.2E+00	--	na	1.1E+02
Hexachlorocyclopentadiene	0	--	--	na	1.1E+03	--	--	na	2.0E+04	--	--	--	--	--	--	--	--	--	--	na	2.0E+04
Hexachloroethane ^C	0	--	--	na	3.3E+01	--	--	na	2.1E+03	--	--	--	--	--	--	--	--	--	--	na	2.1E+03
Hydrogen Sulfide	0	--	2.0E+00	na	--	--	1.8E+01	na	--	--	--	--	--	--	--	--	--	--	1.8E+01	na	--
Indeno (1,2,3-cd) pyrene ^C	0	--	--	na	1.8E-01	--	--	na	1.1E+01	--	--	--	--	--	--	--	--	--	--	na	1.1E+01
Iron	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Isophorone ^C	0	--	--	na	9.6E+03	--	--	na	6.1E+05	--	--	--	--	--	--	--	--	--	--	na	6.1E+05
Kepone	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	--	--	--	--	--	--	--	--	0.0E+00	na	--
Lead	0	4.7E+01	3.5E+00	na	--	1.6E+02	3.1E+01	na	--	--	--	--	--	--	--	--	--	1.6E+02	3.1E+01	na	--
Malathion	0	--	1.0E-01	na	--	--	9.0E-01	na	--	--	--	--	--	--	--	--	--	--	9.0E-01	na	--
Manganese	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Mercury	0	1.4E+00	7.7E-01	--	--	4.8E+00	6.9E+00	--	--	--	--	--	--	--	--	--	--	4.8E+00	6.9E+00	--	--
Methyl Bromide	0	--	--	na	1.5E+03	--	--	na	2.8E+04	--	--	--	--	--	--	--	--	--	--	na	2.8E+04
Methylene Chloride ^C	0	--	--	na	5.9E+03	--	--	na	3.7E+05	--	--	--	--	--	--	--	--	--	--	na	3.7E+05
Methoxychlor	0	--	3.0E-02	na	--	--	2.7E-01	na	--	--	--	--	--	--	--	--	--	--	2.7E-01	na	--
Mirex	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	--	--	--	--	--	--	--	--	0.0E+00	na	--
Nickel	0	9.8E+01	8.2E+00	na	4.6E+03	3.3E+02	7.4E+01	na	8.4E+04	--	--	--	--	--	--	--	--	3.3E+02	7.4E+01	na	8.4E+04
Nitrate (as N)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Nitrobenzene	0	--	--	na	6.9E+02	--	--	na	1.3E+04	--	--	--	--	--	--	--	--	--	--	na	1.3E+04
N-Nitrosodimethylamine ^C	0	--	--	na	3.0E+01	--	--	na	1.9E+03	--	--	--	--	--	--	--	--	--	--	na	1.9E+03
N-Nitrosodiphenylamine ^C	0	--	--	na	6.0E+01	--	--	na	3.8E+03	--	--	--	--	--	--	--	--	--	--	na	3.8E+03
N-Nitrosodi-n-propylamine ^C	0	--	--	na	5.1E+00	--	--	na	3.2E+02	--	--	--	--	--	--	--	--	--	--	na	3.2E+02
Nonylphenol	0	2.8E+01	6.6E+00	--	--	9.6E+01	5.9E+01	na	--	--	--	--	--	--	--	--	--	9.6E+01	5.9E+01	na	--
Parathion	0	6.5E-02	1.3E-02	na	--	2.2E-01	1.2E-01	na	--	--	--	--	--	--	--	--	--	2.2E-01	1.2E-01	na	--
PCB Total ^C	0	--	1.4E-02	na	6.4E-04	--	1.3E-01	na	4.0E-02	--	--	--	--	--	--	--	--	--	1.3E-01	na	4.0E-02
Pentachlorophenol ^C	0	5.4E+00	3.8E+00	na	3.0E+01	1.9E+01	3.4E+01	na	1.9E+03	--	--	--	--	--	--	--	--	1.9E+01	3.4E+01	na	1.9E+03
Phenol	0	--	--	na	8.6E+05	--	--	na	1.6E+07	--	--	--	--	--	--	--	--	--	--	na	1.6E+07
Pyrene	0	--	--	na	4.0E+03	--	--	na	7.3E+04	--	--	--	--	--	--	--	--	--	--	na	7.3E+04
Radionuclides	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Gross Alpha Activity (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Beta and Photon Activity (mrem/yr)	0	--	--	na	4.0E+00	--	--	na	7.3E+01	--	--	--	--	--	--	--	--	--	--	na	7.3E+01
Radium 226 + 228 (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Uranium (ug/l)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--

Parameter (ug/l unless noted)	Background Conc.	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
		Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Selenium, Total Recoverable	0	2.0E+01	5.0E+00	na	4.2E+03	6.8E+01	4.5E+01	na	7.7E+04	--	--	--	--	--	--	--	--	6.8E+01	4.5E+01	na	7.7E+04
Silver	0	9.7E-01	--	na	--	3.3E+00	--	na	--	--	--	--	--	--	--	--	--	3.3E+00	--	na	--
Sulfate	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
1,1,2,2-Tetrachloroethane ^C	0	--	--	na	4.0E+01	--	--	na	2.5E+03	--	--	--	--	--	--	--	--	--	--	na	2.5E+03
Tetrachloroethylene ^C	0	--	--	na	3.3E+01	--	--	na	2.1E+03	--	--	--	--	--	--	--	--	--	--	na	2.1E+03
Thallium	0	--	--	na	4.7E-01	--	--	na	8.6E+00	--	--	--	--	--	--	--	--	--	--	na	8.6E+00
Toluene	0	--	--	na	6.0E+03	--	--	na	1.1E+05	--	--	--	--	--	--	--	--	--	--	na	1.1E+05
Total dissolved solids	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Toxaphene ^C	0	7.3E-01	2.0E-04	na	2.8E-03	2.5E+00	1.8E-03	na	1.8E-01	--	--	--	--	--	--	--	--	2.5E+00	1.8E-03	na	1.8E-01
Tributyltin	0	4.6E-01	7.2E-02	na	--	1.6E+00	6.5E-01	na	--	--	--	--	--	--	--	--	--	1.6E+00	6.5E-01	na	--
1,2,4-Trichlorobenzene	0	--	--	na	7.0E+01	--	--	na	1.3E+03	--	--	--	--	--	--	--	--	--	--	na	1.3E+03
1,1,2-Trichloroethane ^C	0	--	--	na	1.6E+02	--	--	na	1.0E+04	--	--	--	--	--	--	--	--	--	--	na	1.0E+04
Trichloroethylene ^C	0	--	--	na	3.0E+02	--	--	na	1.9E+04	--	--	--	--	--	--	--	--	--	--	na	1.9E+04
2,4,6-Trichlorophenol ^C	0	--	--	na	2.4E+01	--	--	na	1.5E+03	--	--	--	--	--	--	--	--	--	--	na	1.5E+03
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Vinyl Chloride ^C	0	--	--	na	2.4E+01	--	--	na	1.5E+03	--	--	--	--	--	--	--	--	--	--	na	1.5E+03
Zinc	0	6.3E+01	4.8E+01	na	2.6E+04	2.1E+02	4.3E+02	na	4.8E+05	--	--	--	--	--	--	--	--	2.1E+02	4.3E+02	na	4.8E+05

Notes:

- All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
- Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
- Metals measured as Dissolved, unless specified otherwise
- "C" indicates a carcinogenic parameter
- Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information.
Antidegradation WLAs are based upon a complete mix.
- Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
= (0.1(WQC - background conc.) + background conc.) for human health
- WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens and Harmonic Mean for Carcinogens. To apply mixing ratios from a model set the stream flow equal to (mixing ratio - 1), effluent flow equal to 1 and 100% mix.

Metal	Target Value (SSTV)
Antimony	1.2E+04
Arsenic	4.6E+02
Barium	na
Cadmium	2.3E+00
Chromium III	1.7E+02
Chromium VI	2.2E+01
Copper	9.2E+00
Iron	na
Lead	1.9E+01
Manganese	na
Mercury	1.9E+00
Nickel	4.4E+01
Selenium	2.7E+01
Silver	1.3E+00
Zinc	8.6E+01

Note: do not use QL's lower than the minimum QL's provided in agency guidance

Attachment H: Stats.exe Results

Stats.exe results for VA0020346- Emporia WWTP

Facility = Emporia WWTP
Chemical = Dissolved Cadmium
Chronic averaging period = 4
WLAa = 5.8
WLAc = 4.4
Q.L. = .3
samples/mo. = 1
samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = .33
Variance = .039204
C.V. = 0.6
97th percentile daily values = .803027
97th percentile 4 day average = .549050
97th percentile 30 day average = .397997
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

0.33 µg/L

Facility = Emporia WWTP
Chemical = Dissolved Copper
Chronic averaging period = 4
WLAa = 23
WLAc = 32
Q.L. = .5
samples/mo. = 1
samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 5.6
Variance = 11.2896
C.V. = 0.6
97th percentile daily values = 13.6271
97th percentile 4 day average = 9.31722
97th percentile 30 day average = 6.75389
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

5.6 µg/L

Facility = Emporia WWTP
Chemical = Dissolved Lead
Chronic averaging period = 4
WLAa = 160
WLAc = 31
Q.L. = .5
samples/mo. = 1
samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = .5
Variance = .09
C.V. = 0.6
97th percentile daily values = 1.21670
97th percentile 4 day average = .831895
97th percentile 30 day average = .603026
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

0.5 µg/L

Facility = Emporia WWTP
Chemical = Dissolved Nickel
Chronic averaging period = 4
WLAa = 330
WLAc = 74
Q.L. = .94
samples/mo. = 1
samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 2.3
Variance = 1.9044
C.V. = 0.6
97th percentile daily values = 5.59686
97th percentile 4 day average = 3.82671
97th percentile 30 day average = 2.77392
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

2.3 µg/L

Facility = Emporia WWTP
Chemical = Total recoverable selenium
Chronic averaging period = 4
WLAa = 68
WLAc = 45
Q.L. = 2.0
samples/mo. = 1
samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 5
Variance = 9
C.V. = 0.6
97th percentile daily values = 12.1670
97th percentile 4 day average = 8.31895
97th percentile 30 day average = 6.03026
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

5.0 µg/L

Although total recoverable selenium was reported on the application as <5.0 µg/L, the lab QL of 5.0 µg/L is greater than the Agency QL of 2.0 µg/L. For this reason, total recoverable selenium was treated as present at the lab QL of 5.0 µg/L for the purpose of this evaluation. No limit is needed.

Facility = Emporia WWTP
Chemical = Dissolved Zinc
Chronic averaging period = 4
WLAa = 210
WLAc = 430
Q.L. = 3.6
samples/mo. = 1
samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 47
Variance = 795.24
C.V. = 0.6
97th percentile daily values = 114.370
97th percentile 4 day average = 78.1981
97th percentile 30 day average = 56.6845
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

47 µg/L

Facility = Emporia WWTP
Chemical = Ammonia-N
Chronic averaging period = 30
WLAa = 61.7
WLAc = 26.4
Q.L. = .2
samples/mo. = 1
samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average = 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

9.0 mg/L

Although ammonia-N was reported on the permit application as less than the QL, ammonia-N is a known component of domestic wastewater, with the expected concentration of 9.0 mg/L. In accordance with GM00-2011, a datum of 9.0 mg/L is used to perform a reasonable potential analysis on this parameter. No limit is needed.

Facility = Emporia WWTP
Chemical = Dissolved silver
Chronic averaging period = 4
WLAa = 3.3
WLAc =
Q.L. = .2
samples/mo. = 1
samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = .5
Variance = .09
C.V. = 0.6
97th percentile daily values = 1.21670
97th percentile 4 day average = .831895
97th percentile 30 day average = .603026
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

0.5 µg/L

Although dissolved silver was reported on the application as <0.5 µg/L, the lab QL of 0.5 µg/L is greater than the Agency QL of 0.20 µg/L. For this reason, dissolved silver was treated as present at the lab QL of 0.50 µg/L for the purpose of this evaluation. No limit is needed.

Facility = Emporia WWTP
Chemical = Chlorides
Chronic averaging period = 4
WLAa = 2900000
WLAc = 2100000
Q.L. = 1
samples/mo. = 1
samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 67900
Variance = 1659747
C.V. = 0.6
97th percentile daily values = 165229.
97th percentile 4 day average = 112971.
97th percentile 30 day average= 81891.0
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

67900 µg/L

Attachment I: Stream Sanitation Memorandum (8/9/1988)

MEMORANDUM

State Water Control Board

2111 North Hamilton Street

P. O. Box 11143

Richmond, VA. 23230

SUBJECT: The Proposed Effluent Limits for Emporia STP,
Greensville County, Meherrin River, Chowan River Basin

TO: Martin Ferguson via Tom Modena *JDM ok 8-12-88*

FROM: D. X. Ren, PRO *(9x)*

DATE: August 9, 1988

COPIES: George Whitaker, File

On July 28, 1988, Emporia STP submitted a request of stream analysis for a new discharge flow ($Q = 1.5$ MGD).

After reviewing the existing models, this discharge was included in the modeling efforts of Greensville County STP in August 1985.

Based on the existing data in the above described file, a steam analysis was performed using a PC version to simulate CBOD, NBOD, and DO. TKN was of special concern in its effluent limits because of the nature of the discharge and the existence of other industrial discharges upstream. This modeling version duplicates the previous result, using a programmable calculator (Monroe).

This facility was addressed in the 303(e) plan. To be consistent with the previous model, antidegradation policy was not applied for this case, as in the Greensville County model.

The modeling parameters used for this case are indicated on the attached table.

From the results, the following effluent limits are proposed for the Emporia STP:

$Q = 1.50$ MGD
 $BOD_5 = 30.0$ mg/l
 $DO = 5.0$ mg/l
Temp = $28^{\circ}C$

The input to the model for BOD was $CBOD_5 = 25.0$ mg/l, ($CBOD_u / CBOD_5 = 2.5$). This was converted to $BOD_5 = 30.0$ mg/l for the discharge limits. NBOD calculation was based on the previous formula, $NBOD_u = 4.33 * TKN$. Because the model resulted in $TKN = 20$, TKN will not be included in the effluent limits for this case.

If you have any questions about this, please let me know.

**Attachment J: Threatened and Endangered Species
Screening Documents**



Department of Conservation & Recreation
CONSERVING VIRGINIA'S NATURAL & RECREATIONAL RESOURCES

WebID: W634463255563750000

Client Project Number: VA0020346

PROJECT INFORMATION

TITLE: Emporia WWTP

DESCRIPTION: minor industrial facility w/ 1.500 MGD design flow

EXISTING SITE CONDITIONS: receiving stream is nontidal

QUADRANGLES: EMPORIA

COUNTIES: City of Emporia

Latitude/Longitude (DMS): 364043/773135

Acreage: 3

Comments: Please contact me if you have any questions.

REQUESTOR INFORMATION

Priority: No

Tier Level: 2

Tax ID:

Contact Name: Janine Howard

Company Name: DEQ-Piedmont Regional Office

Address: 4949-A Cox Road

City: Glen Allen

State: VA

Zip: 23060

Phone: 804-527-5046

Fax: 804-527-5106

Email: janine.howard@deq.virginia.gov

Conservation Site Name	Site Type	Brank	Acreage	Listed Species Presence
	GLNHR			NL
	GLNHR			NL
	GLNHR			NL
MEHERRIN RIVER SCU	SCU	B3	9	SL
Natural Heritage Conservation Sites within Search Radius				

Site-Name	Group-Name	common-name	scientific-name	GRANK	SRANK	Fed Status	st status	EO Rank	last obs date	precision
	Invertebrate Animal	Eastern Lampmussel	Lampsilis radiata	G5	S2S3			CD	1995-08-14	S
	Vascular Plant	Bush's Muhly	Muhlenbergia bushii	G5	S1			H	1938-09-20	G
	Vertebrate Animal	Dwarf Waterdog	Necturus punctatus	G4	S2S3			H	ND	G
MEHERRIN RIVER SCU	Invertebrate Animal	Green Floater	Lasmigona subviridis	G3	S2		LT	D	1995-08-14	S
MEHERRIN RIVER SCU	Invertebrate Animal	Roanoke Slabshell	Elliptio roanokensis	G3	S1			BC	1990-08-20	S
MEHERRIN RIVER SCU	Invertebrate Animal	Yellow Lampmussel	Lampsilis cariosa	G3G4	S2			C	1995-08-14	S
MEHERRIN RIVER SCU	Invertebrate Animal	Yellow Lance	Elliptio lanceolata	G2G3	S2S3	SOC		D	1990-08-20	S
Natural Heritage Resources within Search Radius										



Quads: EMPORIA

Counties: City of Emporia

Emporia WWTP

Company: DEQ-Piedmont
Regional Office

Lat/Long: 364043/773135



COMMONWEALTH of VIRGINIA

DEPARTMENT OF CONSERVATION AND RECREATION

The project mapped as part of this report has been searched against the Department of Conservation and Recreation's Biotics Data System for occurrences of natural heritage resources from the area indicated for this project. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

According to the information currently in Biotics files, **NATURAL HERITAGE RESOURCES HAVE BEEN DOCUMENTED** within two miles of the indicated project boundaries.

You have submitted this project to DCR for a more detailed review for potential impacts to natural heritage resources. DCR will review the submitted project to identify the specific natural heritage resources in the vicinity of the proposed project. Using the expertise of our biologists, DCR will evaluate whether your specific project is likely to impact these resources, and if so how. DCR's response will indicate whether any negative impacts are likely and, if so, make recommendations to avoid, minimize and/or mitigate these impacts. If the potential negative impacts are to species that are state- or federally-listed as threatened or endangered, DCR will also recommend coordination with the appropriate regulatory agencies: the Virginia Department of Game and Inland Fisheries for state-listed animals, the Virginia Department of Agriculture and Consumer Services for state-listed plants and insects, and the United States Fish and Wildlife Service for federally listed plants and animals. If your project is expected to have positive impacts we will report those to you with recommendations for enhancing these benefits.

Please allow up to 30 days for a response.

We will review the project based on the information you included in the Project Info submittal form, which is included in the report that follows. Often additional information can help us make a more accurate and detailed assessment of a project's potential impacts to natural heritage resources. If you have additional information that you believe will help us better assess your project's potential impacts, you may send that information to us. Please refer to the project Title (from the first page of this report) and include this pdf file with any additional information you send us.

Thank you for submitting your project for review to the Virginia Natural Heritage Program through the NH Data Explorer. Should you have any questions or concerns about DCR, the Data Explorer, or this report, please contact the Natural Heritage Project Review Unit at 804-371-2708.

its.

Douglas W. Domenech
Secretary of Natural Resources



David A. Johnson
Director

COMMONWEALTH of VIRGINIA
DEPARTMENT OF CONSERVATION AND RECREATION

Division of Natural Heritage
213 Governor Street
Richmond, Virginia 23219-2010
(804) 786-7951

August 8, 2011

Janine Howard
DEQ-PRO
4949-A Cox Road
Glen Allen, VA 23060

Re: VA0020346, Emporia WWTP

Dear Ms. Howard:

The Department of Conservation and Recreation's Division of Natural Heritage (DCR) has searched its Biotics Data System for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

According to the information currently in our files, the Meherrin River Stream Conservation Unit (SCU) is in the project vicinity. SCUs identify stream reaches that contain aquatic natural heritage resources, including 2 miles upstream and 1 mile downstream of documented occurrences, and all tributaries within this reach. SCUs are given a biodiversity significance ranking based on the rarity, quality, and number of element occurrences they contain; on a scale of 1-5, 1 being most significant. The Meherrin River has been given a biodiversity significance ranking of B3, which represents a site of high significance. The natural heritage resources of concern associated with this SCU are:

<i>Lampsilis cariosa</i>	Yellow lampmussel	G3G4/S2/NL/NL
<i>Lasmigona subviridis</i>	Green floater	G3/S2/NL/LT
<i>Elliptio lanceolata</i>	Yellow lance	G2G3/S2S3/SOC/NL
<i>Elliptio roanokensis</i>	Roanoke slabshell	G3/S1/NL/NL

The Yellow lampmussel ranges from Nova Scotia to Georgia in Atlantic slope drainages (NatureServe, 2009). In Virginia, it is recorded from the Roanoke, Chowan, James, York, and Potomac drainages. It is found in larger streams and rivers where good currents exist over sand and gravel substrates and in small creeks and ponds (Johnson, 1970).

The Green floater, a rare freshwater mussel, ranges from New York to North Carolina in the Atlantic Slope drainages, as well as the New and Kanawha River systems in Virginia and West Virginia (NatureServe, 2009). In Virginia, there are records from the New, Roanoke, Chowan, James, York, Rappahannock, and Potomac River drainages. Throughout its range, the Green floater appears to prefer the pools and eddies with gravel and sand bottoms of smaller rivers and creeks, smaller channels of large

rivers (Ortman, 1919) or small to medium-sized streams (Riddick, 1973). Please note that this species has been listed as state threatened by the VDGIF.

The Yellow lance occurs in mid-sized rivers and second and third order streams. To survive, it needs a silt-free, stable streambed and well-oxygenated water that is free of pollutants. This species has been the subject of taxonomic debate in recent years (NatureServe, 2009). Currently in Virginia, the Yellow lance is recognized from populations in the Chowan, James, York, and Rappahannock drainages. Its range also extends into Neuse-Tar river system in North Carolina. In recent years, significant population declines have been noted across its range (NatureServe, 2009). Please note that this species is currently classified as a species of concern by the United States Fish and Wildlife Service (USFWS); however, this designation has no official legal status.

The Roanoke slabshell is a relatively large freshwater mussel species that is typically found in riffle habitats of large rivers. This species probably is rather sessile with only limited movement in the substrate. Passive downstream movement may occur when mussels are displaced from the substrate during floods. The Roanoke slabshell is most closely associated with large Atlantic slope rivers from the Savannah River Basin to the Chowan River Basin (NatureServe, 2009). Tributary creeks and rivers occasionally provide significant habitat. The best populations occur where anadromous fish (probable primary fish hosts) have access to lotic habitats. Small or declining populations may be found above dams and their associated reservoirs which serve as barriers to anadromous fish. Presently, this species is usually found in near-shore trough habitats in sand/gravel substrates. It may also be found in more coarse substrates. The species was probably an abundant, dominant mussel within its historical range during past centuries, but its populations are now significantly reduced due to factors such as pollution, siltation, and the creation of reservoirs along rivers.

The Dwarf waterdog (*Necturus punctatus*, G4/S2S3/NL/NL), has been historically documented in the project vicinity. The Dwarf waterdog, a state rare salamander, is known from Atlantic slope drainages from Virginia to Georgia (Petranka, 1998). In Virginia, it inhabits small, slow-flowing streams in the Chowan River drainages, where the juveniles burrow in the silty bottoms. In the winter, the adults congregate in leaf beds. Waterdogs are completely aquatic and have four toes on each hind foot and conspicuous gills that are retained throughout life (Martof et al., 1980).

Threats to the Dwarf waterdog may include habitat alterations such as impoundments and channels; however, populations seem to be stable and they do not seem to be affected by moderate siltation and pollution (AmphibiaWeb, 2010).

Considered good indicators of the health of aquatic ecosystems, freshwater mussels are dependent on good water quality, good physical habitat conditions, and an environment that will support populations of host fish species (Williams et al., 1993). Because mussels are sedentary organisms, they are sensitive to water quality degradation related to increased sedimentation and pollution. They are also sensitive to habitat destruction through dam construction, channelization, and dredging, and the invasion of exotic mollusk species.

To minimize impacts to aquatic resources, DCR recommends the use of uv/ozone to replace chlorination disinfection and utilization of new technologies as they become available to improve water quality. Due to the legal status of the Green floater, DCR also recommends coordination with the VDGIF to ensure compliance with protected species legislation.

There are no State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

Under a Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the Virginia Department of Conservation and Recreation (DCR), DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. The current activity will not affect any documented state-listed plants or insects.

New and updated information is continually added to Biotics. Please contact DCR for an update on this natural heritage information if a significant amount of time passes before it is utilized.

The Virginia Department of Game and Inland Fisheries maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters that may contain information not documented in this letter. Their database may be accessed from <http://vafwis.org/fwis/> or contact Shirl Dressler at (804) 367-6913.

Should you have any questions or concerns, feel free to contact me at 804-371-2708. Thank you for the opportunity to comment on this project.

Sincerely,

A handwritten signature in black ink, appearing to read "S. Rene' Hypes", with a stylized flourish at the end.

S. Rene' Hypes
Project Review Coordinator

CC: Ernie Aschenbach, VDGIF
Tylan Dean, USFWS

Literature Cited

AmphibiaWeb: Information on amphibian biology and conservation. [web application]. 2010. Berkeley, California: AmphibiaWeb. Available: <http://amphibiaweb.org/>. (Accessed: Apr 22, 2010).

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Howard, Janine (DEQ)

From: Howard, Janine (DEQ)
Sent: Friday, September 16, 2011 11:08 AM
To: Hypes, Rene (DCR)
Subject: RE: VA0020346, Emporia WWTP
Attachments: image001.jpg

René,

Thank you for your detailed review and response to our T&E coordination effort. Coordination with VDGIF was initiated today to allow them the opportunity to comment on the permit reissuance and the presence of the Green floater in the Meherrin River Stream Conservation Unit.

Note is made of your recommendation of the use of UV or ozone disinfection to replace chlorination as the means of effluent bacteria reduction. I am pleased to tell you that this facility already utilizes UV technology to disinfect their effluent rather than chlorine.

Please let me know if you have any questions or concerns and again, thank you for your review.

Sincerely,

Janine

Janine L. Howard
Water Permit Writer

DEQ Piedmont Regional Office
4949-A Cox Road
Glen Allen, VA 23060
t: (804) 527-5046
f: (804) 527-5106

This email should not be considered a legal opinion or a case decision as defined by the Administrative Process Act, Code of Virginia § 2.2-4000 *et seq.*

From: nhreview (DCR)
Sent: Monday, August 08, 2011 1:13 PM
To: Howard, Janine (DEQ)
Cc: ProjectReview (DGIF); 'Tylan_Dean@fws.gov'
Subject: VA0020346, Emporia WWTP

Ms. Howard,

Please find attached the Department of Conservation and Recreation, Division of Natural Heritage (DCR-DNH) comments for the above referenced project. The comments are in pdf format and can be printed for your records. Also species rank information is available at http://www.dcr.virginia.gov/natural_heritage/help.shtml for your reference.

Please send a confirmation e-mail upon receipt of our comments. Let us know if you have any questions.

Thank you for the opportunity to comment on this project.

René

S. Rene' Hypes
Project Review Coordinator
DCR-DNH
217 Governor Street

Richmond, Virginia 23219
804-371-2708 (phone)
804-371-2674 (fax)
rene.hypes@dcr.virginia.gov



**Conserving VA's Biodiversity through
Inventory, Protection and Stewardship**
www.dcr.virginia.gov/natural_heritage
[Virginia Natural Heritage Program on Facebook](#)

Howard, Janine (DEQ)

From: Howard, Janine (DEQ)
Sent: Tuesday, February 14, 2012 11:38 AM
To: Aschenbach, Ernie (DGIF)
Subject: RE: ESSLog 32284; VPDES permit#0020346 re-issuance for the Emporia WWTP in Emporia, Virginia

Mr. Aschenbach,

Per your request to be informed if any proposed limitations change, I am writing to inform you that a new toxicity limit is planned for the 2012 Emporia WWTP permit. No other limitations have changed. I have attached the proposed limits page, with the new limitations highlighted. I have also attached the Whole Effluent Toxicity evaluation that lead to the proposed toxicity limit. Please let me know if you require any further information. If I do not hear from you within 30 days of the date of this email I will assume that the T&E evaluation and coordination is complete.

Sincerely,

Janine L. Howard
Water Permit Writer

DEQ Piedmont Regional Office
4949-A Cox Road
Glen Allen, VA 23060
t: (804) 527-5046
f: (804) 527-5106

This email should not be considered a legal opinion or a case decision as defined by the Administrative Process Act, Code of Virginia § 2.2-4000 *et seq.*



WET memo
2_13_12.pdf



limits page.pdf



/A0020346 Emporia
WWTP Toxicit...

From: Howard, Janine (DEQ)
Sent: Tuesday, November 08, 2011 12:56 PM
To: Aschenbach, Ernie (DGIF)
Subject: RE: ESSLog 32284; VPDES permit#0020346 re-issuance for the Emporia WWTP in Emporia, Virginia

Mr. Aschenbach,

Thank you for your T & E review of the Emporia WWTP reissuance. This facility already utilizes UV disinfection and does not chlorinate its effluent. If new water-quality based limits are generate based on effluent data provided in the pending permit application, I will provide VDGIF with an updated limits page. If no new limitations are generated for the 2012 permit, then I will consider the T&E review complete.

Sincerely,

Janine L. Howard
Water Permit Writer

DEQ Piedmont Regional Office
4949-A Cox Road
Glen Allen, VA 23060
t: (804) 527-5046
f: (804) 527-5106

This email should not be considered a legal opinion or a case decision as defined by the Administrative Process Act, Code of Virginia § 2.2-4000 et seq.

From: Aschenbach, Ernie (DGIF)
Sent: Thursday, November 03, 2011 12:03 PM
To: Howard, Janine (DEQ)
Cc: nhreview (DCR); Watson, Brian (DGIF)
Subject: ESSLog 32284; VPDES permit#0020346 re-issuance for the Emporia WWTP in Emporia, Virginia

We have reviewed the above-referenced VPDES permit re-issuance. The existing design flow is 1.982 million gallon per day (MGD). The receiving stream is the Meherrin River. The 7Q10 of the receiving river is 12 MGD. Effluent limitation information is not provided with the DEQ request for DGIF review. According to DEQ, the permit application is due 11/15/2011 and will include comprehensive effluent data.

According to our records, the Meherrin River is designated Threatened and Endangered (T&E) species water for the state Threatened (ST) green floater. The Meherrin River is also a designated anadromous fish use water.

We recommend UV disinfection rather than chlorination, if not already in place. Provided the project adheres to the effluent limitations and monitoring requirements specified in the permit (and remain similar to those specified within the existing permit), we do not anticipate the re-issuance of this existing permit to result in adverse impact to designated potential T&E species waters or their associated listed species.

If future effluent limitations proposed in the pending application for permit re-issuance change, we recommend DEQ provide updated effluent characteristics information to DGIF for our consideration. After reviewing this new information DGIF will provide further guidance protective of freshwater mussels as appropriate.

Thank you for the opportunity to provide comments.

Ernie Aschenbach
Environmental Services Biologist
Virginia Dept. of Game and Inland Fisheries
4010 West Broad Street
Richmond, VA 23230
Phone: (804) 367-2733
FAX: (804) 367-2427
Email: Ernie.Aschenbach@dgif.virginia.gov

**Attachment K: Groundwater Evaluation, Monitoring Well
Location Map, and Corrective Action Plan (CAP) Phase II
Approval Letter and Memo**

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY *Piedmont Regional Office*

4949-A Cox Road, Glen Allen, VA 23060-6296

804/527-5020

SUBJECT: City of Emporia Wastewater Treatment Plant (VA0020346) Groundwater Evaluation

TO: File

FROM: Janine Howard

DATE: September 21, 2011

Process and Background:

The City of Emporia Wastewater Treatment Plant is a major municipal facility with a design flow of 1.5 MGD. The facility is located at 500 Tall Oaks Drive in Emporia, Virginia. The plant sits on about 55 acres and is bounded on the south and east by Falling Run Creek, a tributary of the Meherrin River. The facility serves a population of approximately 5,900 individuals with 2,500 connections. The WWTP is comprised of a 22-acre sludge lagoon, a clarifier and secondary clarifier, oxidation ditches, screening and grit removal, and administrative/laboratory buildings. Under normal operating conditions the sludge lagoon is approximately three feet in depth with two feet of freeboard. The lagoon has been in place since its installation in 1964 and it is unlined. The wastewater treatment plant was first built in 1988 and at the time, the lagoon was the sole form of treatment.

Historically, the facility disposed of its sludge in the sludge lagoon, however in May 2005 a Siemens Water Technologies Corp. "Cannibal" Solids Reduction System was installed at the facility. The "Cannibal" system is designed to significantly reduce the amount of sludge produced at the plant (formerly around 52 dry metric tons per year). The permittee planned to suspend the use of the lagoon sludge disposal but retained the structure as an emergency equalization basin. According to the 2009 inspection report by Charles Stitzer, the "Cannibal" system has not performed as well as expected and while it has reduced the amount of waste solids, the reduction has not been as significant as was hoped. Presently, a small portion of grit that is collected in the screening system preceding the Cannibal system is diverted directly to the sludge lagoon. In addition, the clarifiers are occasionally drained to the sludge lagoon during routine maintenance. Work continues on the "Cannibal" system to improve its efficiency and further reduce its discharge of solids. Once the system is fully operational, it is anticipated that waste sludge will be land-filled. To date, the WWTP continues to dispose of sludge in the lagoon.

The groundwater monitoring plan was designed to allow evaluation of the integrity of the sludge lagoon, and was approved on March 23, 1987. Beginning with the 1996 evaluation of the available data, contamination of groundwater became apparent at MW-2. Contamination issues were also remarked upon in the 2001 evaluation. The 2007 evaluation concluded that the sludge lagoon was having an effect on the groundwater at the site, and noted exceedances of the State of Virginia nitrate and chloride standards at MW-2. As a result, the 2007 permit reissuance required the development of a Corrective

Action Plan (CAP) to ensure that the source of the contamination was eliminated or that the contaminant plume is contained on the permittee's property.

The original groundwater monitoring plan, approved in 1987, consisted of three monitoring wells. MW-1, MW-2, and MW-3 were installed on March 10-11, 1988. MW-1, located on the northwest corner of the lagoon, is the up-gradient well. MW-2 is located on the southeast corner of the lagoon is hydraulically down-gradient of the lagoon. MW-3 is located on the northeast corner of the lagoon. The most recent monitoring well, MW-4, is located south of MW-2, approximately halfway between the lagoon and Falling Run Creek. MW-4 was installed in 2008 as part of the Corrective Action Plan (CAP) required by the 2007 permit. Refer to the attached map for the well locations.

Corrective Action Plan Summary:

The City of Emporia hired Earth Tech, an operating subsidiary of AECOM, to aid in the development of the CAP. The CAP was approached in two phases. The first phase of the CAP was submitted on 3/27/08 and approved on 4/24/2008. This phase of the CAP investigated the hydraulic flow of the groundwater on site in order to determine an appropriate location for an additional down-gradient well. The investigation found that the hydraulic groundwater flow is due south toward Falling Run Creek and that the gradient is nearly flat with a slope of 0.0015. Hydraulic conductivity was tested using single well aquifer tests ("slug tests") and was determined to be between 23-157 ft/day. Groundwater flow velocity was estimated to be 42-286 ft/year. The receptors of the groundwater were also investigated and Falling Run Creek, down-gradient of the sludge lagoon, was determined to be the sole receptor. Phase I of the CAP required a sludge sample to be tested for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, copper, and zinc). The sludge analysis results were all less than the quantification limitation and as such groundwater pollution VOCs, SVOCs, and metals from the lagoon is not a concern at present. Phase I of the CAP also called for surface water sampling at three locations: upstream of the property boundary, down-gradient of the lagoon, and downstream of the property boundary. The purpose of the surface water testing of Falling Run Creek was to establish whether or not the groundwater contamination was having a perceived impact on the receptor of the contamination, Falling Run Creek.

Phase II of the CAP was submitted on 11/21/2008. The surface water testing indicated that transport of nitrate and chlorides from the lagoon to Falling Run Creek had not occurred and analyses of the surface water samples as compared to water quality standards suggest that contamination from the lagoon is not adversely impacting Falling Run Creek. Falling Run Creek, located at the property boundary, was identified in Phase I as the sole receptor of the groundwater pollution. DEQ Guidance Memo 98-2010 requires that if groundwater contamination is detected at down-gradient wells or at the property boundary, then the lagoon must be relined or closed, with one exception. If the receptor of the groundwater contamination is shown to be un-impacted by the groundwater, then no action is needed. Phase II of the Emporia WWTP CAP showed no adverse impacts were felt by Falling Run Creek, the sole groundwater contaminant receptor, therefore the closure/lining of the lagoon was not required by DEQ. The CAP called for continued annual monitoring at the three existing and one new (MW-4) monitoring well. In addition, annual monitoring of four surface water locations (ST-1, ST-2, ST-3, ST-4) for nitrates, chlorides and TOC is required. This will allow for continued monitoring of the groundwater impact on Falling Run Creek. DEQ approved Phase II of the CAP on 2/6/2009.

Groundwater Elevation:

Monitoring data from 1996-2010 were available for evaluation. For the purpose of this evaluation only data submitted following approval of the CAP is displayed. The permit record is clear in that data submitted prior to the CAP has shown alleged degradation of the groundwater from the lagoon. The CAP verified the hydraulic flow of the groundwater, determined that surface water impacts in Falling Run Creek (the sole receptor) were nominal and implemented a fourth groundwater monitoring well and annual surface water monitoring to ensure continued compliance with State Water Quality Standards. Due to the lack of a statistically significant dataset, a statistical analysis was not performed, rather the data is displayed and discussed to date. As required by the approved CAP, groundwater is monitored annually. Parameters monitored and reported include: groundwater elevation, pH, specific conductance, nitrate-nitrogen, total organic carbon, and chlorides.

The facility is located in the Coastal Plain Physiographic Province for which there are specific standards (9VAC25-280-50) and criteria (9VAC25-280-70). Virginia also has groundwater standards that are applicable statewide (9VAC25-280-40). The Antidegradation policy for groundwater (9VAC 25-280-30) requires that the natural quality for all groundwater constituents shall be maintained. This means that in addition to constituents that are assigned numeric criteria in the groundwater standards, the policy also applies to constituents that are not specifically identified or assigned a numeric groundwater standard.

pH:

The groundwater criterion for pH in the Coastal Plain physiographic province is 6.5-9.0 SU. The pH at all monitoring wells, including the up-gradient well, was more acidic than the State groundwater standard established in 9 VAC 25-280-50. pH below the water quality standard is well documented for MW-1, MW-2, and MW-3 and has been observed since 1996. Given the historic acidity of the background, up-gradient well, the sludge lagoon is not considered to be degrading the groundwater pH.

Specific Conductivity:

There are no numeric groundwater criteria for specific conductivity. Specific conductivity is an indication of ions in the groundwater and is suggestive of the presence of other pollutants such as chlorides, nitrates, phosphates and sodium in the groundwater. Specific conductance averaged 104.95 M-M/CM at MW-1, 493.5M-M/CM at MW-2, 94.05M-M/CM at MW-3, and 449.5M0M/CM at MW-4. The increased specific conductance at the down-gradient wells (MW-2 and MW-4) is a continued indication of elevated concentrations of pollutants in the groundwater down-gradient of the lagoon, relative to the ionic concentration of groundwater up-gradient of the sludge lagoon. Note the specific conductance at MW-2 has dropped slightly from 2009 to 2010, whereas the reverse is true for MW-4.

Total Organic Carbon (TOC):

The TOC groundwater criterion is 10 mg/L for the Coastal Play physiographic province. The average TOC concentrations at MW-1, MW-2, MW-3, and MW-4 were 3.3, 2.7, 3.45, and 21.6 mg/L respectively. TOC met the groundwater criterion for all monitoring wells except at MW-4. The spike in TOC in 2010 is notable as TOC has not historically been chronically elevated at MW-4. The TOC concentration at MW-4 was more than seven times greater in 2010 as compared to 2009. Continued monitoring is needed to gain a larger dataset to assess TOC at MW-4. With the exception of MW-4, TOC decreased in 2010 as compared to 2009.

Chloride:

The chloride water quality criterion for the Coastal Plain Physiographic Province is 50 mg/L. The average up-gradient (MW-1) concentration was 5.75 mg/L. At MW-2 and MW-3, average chloride concentrations were 96.6 and 5.15 mg/L respectively. Chloride concentration averaged 63.6 mg/L at MW-4. The 2010 chloride concentration for MW-4 was 122 mg/L, a large increase from the year before. Chloride concentration at the remainder of the wells decreased from 2009 to 2010. Chloride concentrations at MW-2 and MW-4 were in alleged violation of the groundwater quality criteria.

Nitrate Nitrogen (NO₃-N):

The groundwater quality criterion for nitrate-nitrogen in the coastal Plain is 5 mg/L. Nitrate-nitrogen concentrations at MW-1 and MW-3 are in conformance with the standard for 2009 and 2010. Nitrate nitrogen was not detected in MW-4. MW-2 continues to exceed groundwater quality standards set in 9 VAC 25-280-50 for nitrate-nitrogen.

Summary and Recommendation:

The pH recorded at all monitoring wells during 2009-2010 are in alleged violation of the groundwater quality standards. Up-gradient MW-1 had a lower pH than MW-2 and MW-4. Continued monitoring should be conducted to gather sufficient data for evaluation.

Specific conductivities were highest in MW-2 and MW-4. High specific conductivities are suggestive of groundwater pollution. The highest chloride concentrations were found in MW-2 and MW-4, supporting the specific conductivity data. The nitrate-nitrogen concentration was also the highest at MW-2.

The increasing chloride concentrations at the newly established MW-4 suggest that the contaminant plume is migrating. The lack of detection of nitrate-nitrogen at MW-4, counters this argument however. The lagoon is still used for sludge storage, although the volumes have been reduced since the addition of the "Cannibal" system in 2005. The reduction of waste being directed to the sludge lagoon may mitigate groundwater impacts over time. Continued monitoring is necessary to collect a statistically significant dataset.

In-stream Monitoring Summary:

In-stream monitoring has been completed for two years, 2009 and 2010. The raw data is available in Tables A.5 and A.6 in the appendix. There are four monitoring stations, ST-1, ST-2, ST-3, and ST-4. ST-3 is located upstream of the property boundary, ST-1 is downstream of the property boundary, ST-2 is downgradient of MW-2 and MW-4, and ST-4 is located east of MW-2. The first two years of stream sampling data show that nitrate-nitrogen pollution from the groundwater is not impacting Falling Run Creek, as the pollutant was not detected at all sampling stations in 2009 and 2010. The pH of the stream appears slightly acidic and is below the aquatic life standard of 6.0 SU. However, ST-3, upstream of the property boundary has a pH of less than 6.0 S.U., therefore the groundwater down-gradient of the lagoon is not perceived to be a factor in the low surface water pH at ST-1, ST-2, and ST-4. In 2009 and 2010, the upstream station had the highest specific conductance, with the conductivity of the water dropping at ST-2 and ST-4, the stations nearest the contaminated wells (MW-2 and MW-4). Chlorides are found in concentrations below the aquatic life standard and were also documented in the largest concentrations at the upstream station (ST-3). This trend was similarly true for total organic carbon. In summary, the in-stream monitoring suggests that the groundwater contamination from the lagoon is having no adverse affect on the receptor, Falling Run Creek, at this time. Continued monitoring in accordance with the approved CAP is recommended.

Appendix

Note: "ND" means non detect

Table A.1. MW-1 (upgradient well) raw groundwater data.

Date	Ground Water Elevation (ft. MSL)	pH (S.U.)	Specific Conductance (M-M/CM)	Nitrate Nitrogen (NO ₃ N) (mg/L)	Total Organic Carbon (TOC) (mg/L)	Chlorides (mg/L)
2010	18.66	4.68	91.90	1.80	ND	5.40
2009	18.08	5.12	118.00	1.60	3.30	6.10
Average	18.37	4.90	104.95	1.70	3.30	5.75
Standard	n/a	6.5-9.0	n/a	5	10	50

Table A.2 MW-2 raw groundwater data

Date	Ground Water Elevation (ft. MSL)	pH (S.U.)	Specific Conductance (M-M/CM)	Nitrate Nitrogen (NO ₃ N) (mg/L)	Total Organic Carbon (TOC) (mg/L)	Chlorides (mg/L)
2010	16.83	5.13	486	12.9	2.6	90.2
2009	16.83	5.26	501	20.5	2.8	103
Average	16.83	5.195	493.5	16.7	2.7	96.6
Standard	n/a	6.5-9	n/a	5	10	50

Table A.3. MW-3 raw groundwater data

Date	Ground Water Elevation (ft. MSL)	pH (S.U.)	Specific Conductance (M-M/CM)	Nitrate Nitrogen (NO ₃ N) (mg/L)	Total Organic Carbon (TOC) (mg/L)	Chlorides (mg/L)
2010	9.0	4.81	103	0.93	2.9	2.9
2009	11.33	4.69	85.1	0.70	4.0	7.4
Average	10.165	4.75	94.05	0.815	3.45	5.15
Standard	n/a	6.5-9	n/a	5	10	50

Table A.4. MW-4 raw groundwater data

Date	Ground Water Elevation (ft. MSL)	pH (S.U.)	Specific Conductance (M-M/CM)	Nitrate Nitrogen (NO ₃ N) (mg/L)	Total Organic Carbon (TOC) (mg/L)	Chlorides (mg/L)
2010	9.5	5.15	477	ND	37.9	122
2009	10.16	5.46	422	ND	5.3	5.3
Average	9.83	5.305	449.5		21.6	63.6
Standard	n/a	6.5-9	n/a	5	10	50

Table A.5 2009 (10/08-10/09) Stream Sampling Raw Data

Parameter	Sampling Station				
	ST-1	ST-2	ST-3	ST-4	Aquatic Life Standard
pH (S.U.)	6.45	5.95	5.79	5.79	6.0-9.0
Specific Conductivity (M-M/CM)	292	166	373	177	NA
Nitrate-Nitrogen (mg/L)	ND	ND	ND	ND	NA
Total Organic Carbon (mg/L)	18.8	32.2	63.0	30.3	NA
Chlorides (mg/L)	18.8	35.2	99.3	34.8	860

Table A.6 2010 (10/09-10/10) Stream Sampling Raw Data

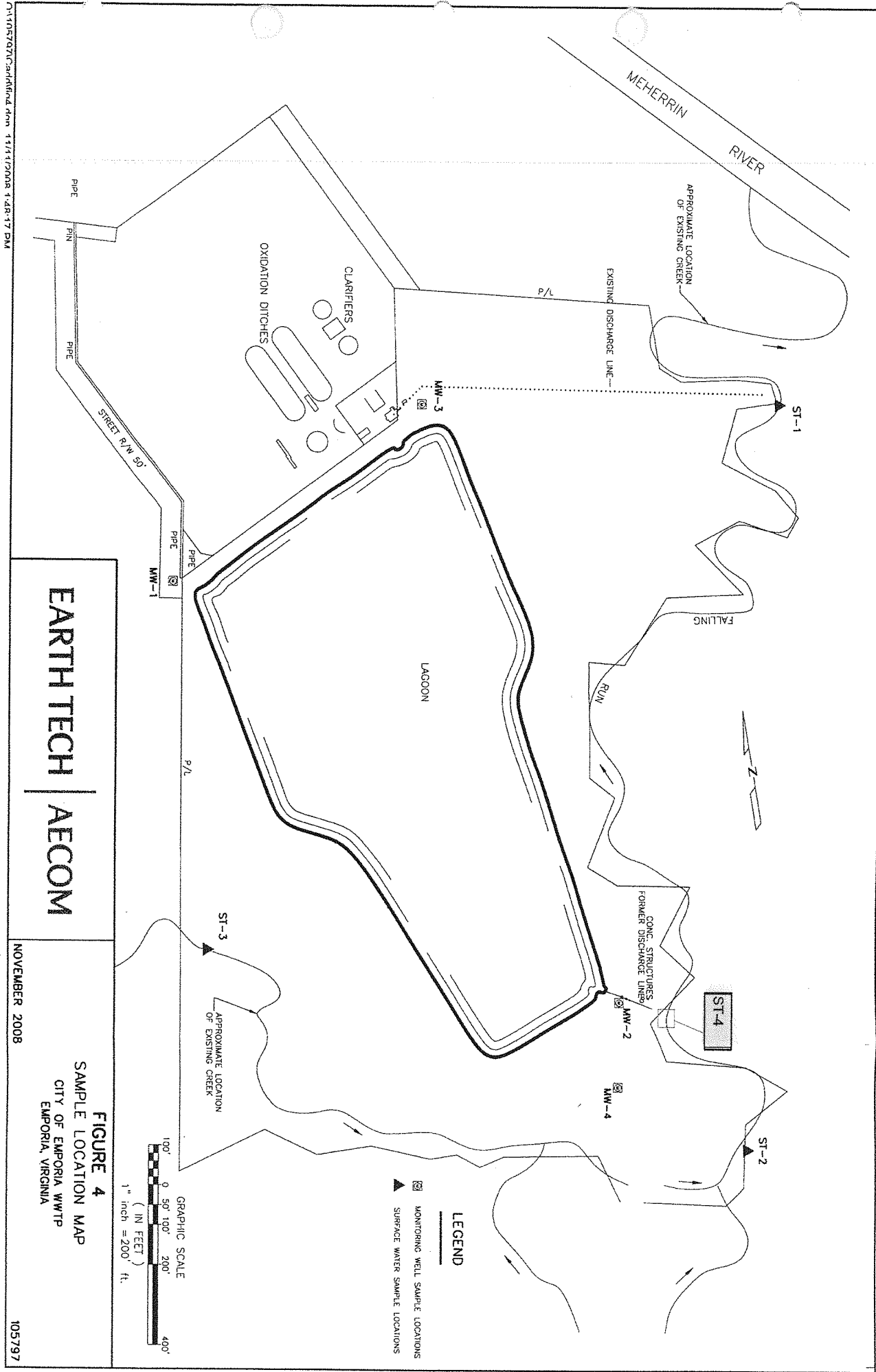
Parameter	Sampling Station				
	ST-1	ST-2	ST-3	ST-4	Aquatic Life Standard
pH (S.U.)	4.48	5.02	4.70	4.34	6.0-9.0
Specific Conductivity (M-M/CM)	291	288	689	297	NA
Nitrate-Nitrogen (mg/L)	ND	ND	ND	ND	NA
Total Organic Carbon (mg/L)	18.6	87.6	66.7	31.7	NA
Chlorides (mg/L)	30.5	29.0	112	28.4	860

ST-1 = downstream property boundary

ST-2 = down-gradient of MW-2 and MW-4

ST-3 = upstream property boundary

ST-4 = east of MW-2





COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY PIEDMONT REGIONAL OFFICE

Preston Bryant
Secretary of Natural Resources

4949-A Cox Road, Glen Allen, Virginia 23060
(804) 527-5020 Fax (804) 527-5106
www.deq.virginia.gov

David K. Paylor
Director

February 6, 2009

Larry Epps
Superintendent of Wastewater Treatment
City of Emporia
P.O. Box 511
Emporia, Virginia 23847

RE: VPDES Permit No. VA0020346 – City of Emporia WWTP
Phase II of the Corrective Action Plan (CAP)

Dear Mr. Epps:

The Department of Environmental Quality (DEQ) has reviewed the above referenced CAP submitted November 21, 2008. Approval of the CAP is contingent upon the following modification. The permittee shall collect and analyze surface water samples from the locations proposed in the CAP and a fourth location identified by DEQ staff in the enclosed map on an annual basis. This action is in accordance with a memorandum dated January 30, 2008, a copy of which is enclosed for your information.

DEQ staff request that the City of Emporia respond within 30 days either accepting the proposed changes or making an alternate proposal. Upon written concurrence from the City of Emporia, this CAP will be incorporated by reference into the City of Emporia's WWTP Permit No. VA0020346.

The facility's Operation and Maintenance Manual should also be revised to reflect the approved CAP. Please note that the Operation and Maintenance Manual must be revised and submitted for DEQ approval within 90 days of the effective date of the changes.

Please contact Emilee Carpenter in the Piedmont Regional Office at 804/527-5072 or eccarpenter@deq.virginia.gov if you have any questions.

Sincerely,

Curtis J. Linfderman, P.E.
Water Permit Manager

Enclosure: Approval Memo, Surface Water Sample Location Map

CJL/ecc



MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY *Piedmont Regional Office*

4949-A Cox Road

Glen Allen, VA 23060

804/527-5020

SUBJECT: VPDES Permit No. VA0020346
City of Emporia WWTP
Corrective Action Plan (CAP) Phase II

TO: Curtis J. Linderman, P.E., Water Permit Manager

FROM: Emilee Carpenter, Water Permit Writer

DATE: January 30, 2009

COPIES: Larry Epps

Type of Report: Phase II of the Corrective Action Plan. Phase I was approved on April 24, 2008. Notification of Phase I completion and the Phase II proposal were submitted on November 21, 2008.

- 1) Description: The CAP was submitted in accordance with Part I.B.8 of the current VPDES permit. Ground water monitoring data submitted since 1996 indicates that the groundwater in the vicinity of the lagoon has been affected. Violations of the Groundwater Standard for nitrates and the Coastal Plain Water Quality Criterion for chlorides were observed. Phase I was designed to assess the nature, fate and transport of the pollutants, aquifer characteristics, estimated size and location of contaminant plume and calculations of the plume's movement with respect to potential receptors. Phase II is intended to evaluate the information collected in Phase I and to determine the appropriate response to the observed groundwater contamination.

Phase I demonstrated the following:

- 2) Groundwater flow direction is due south toward Falling Run, and the hydraulic gradient is nearly flat, with a slope measuring 0.0015.
- 3) Hydraulic conductivity was measured using slug tests. The results indicate conductivity values ranging from 23 ft/day to 157 ft/day. Groundwater flow velocity was calculated using hydraulic gradient, conductivity and the assumed effective porosity of sands to produce a range of 42 ft/year to 286 ft/year.
- 4) Based on the determined flow direction, a fourth monitoring well was installed downgradient of MW-2, approximately half-way between the lagoon and Falling Run.
- 5) A sludge sample from the lagoon was analyzed to identify potential pollutants in the groundwater. Results for VOCs, SVOCs, and metals

(arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, copper and zinc) were all less than the quantification limit. Consequently, the City of Emporia was allowed to streamline subsequent groundwater and surface water analyses to consist of nitrates, chlorides, and total organic carbon.

- 6) Groundwater analyses continue to indicate that nitrates and chloride are present in the downgradient wells at concentrations above the groundwater standard (10 mg/L) for nitrates and the coastal plain groundwater criterion (50 mg/L) for chloride. Surface water results were all below surface water quality standards. No standard has been established for total organic carbon in surface water. However, a comparison of groundwater and surface water results indicates that surface water concentrations are significantly higher than groundwater concentrations. Therefore, groundwater does not appear to be the source of the total organic carbon concentrations observed in the surface water.

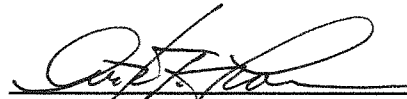
Phase II presents the following:

- 7) Analytical results indicate that transport of nitrates and chlorides from the lagoon to Falling Run has not occurred. Reconnaissance of the area and review of courthouse records show that no downgradient receptors are located between the lagoon and Falling Run. Since Falling Run is the property boundary and the nearest receptor, no risk of human exposure is anticipated. In addition, analyses of surface water samples in comparison with the surface water quality standards that protect aquatic life uses, suggest that contamination from the lagoon does not adversely impact Falling Run.
- 8) According to VDEQ Guidance Memo 98-2010, if contamination is detected in downgradient/property boundary wells, the lagoon must be relined or closed out, unless the unit is discharging via the groundwater to a surface water receptor either on the property or abutting the property boundary and in-stream monitoring indicates no adverse impact to the surface water.
- 9) As part of this CAP, the City of Emporia plans to monitor Wells MW-1, MW-2, MW-3, MW-4 on an annual basis, continue use of the lagoon for effluent overflow from the treatment plant, and collect and analyze surface water samples for nitrates, chloride and TOC at locations down gradient of wells MW-2 and MW-4 once every 5 years.

Recommendations:

The staff recommends approval of the CAP described above, contingent upon the following modification: Surface water samples shall be collected on an annual basis at the locations established in the CAP in addition to a fourth location identified in the attached map.

Approved:

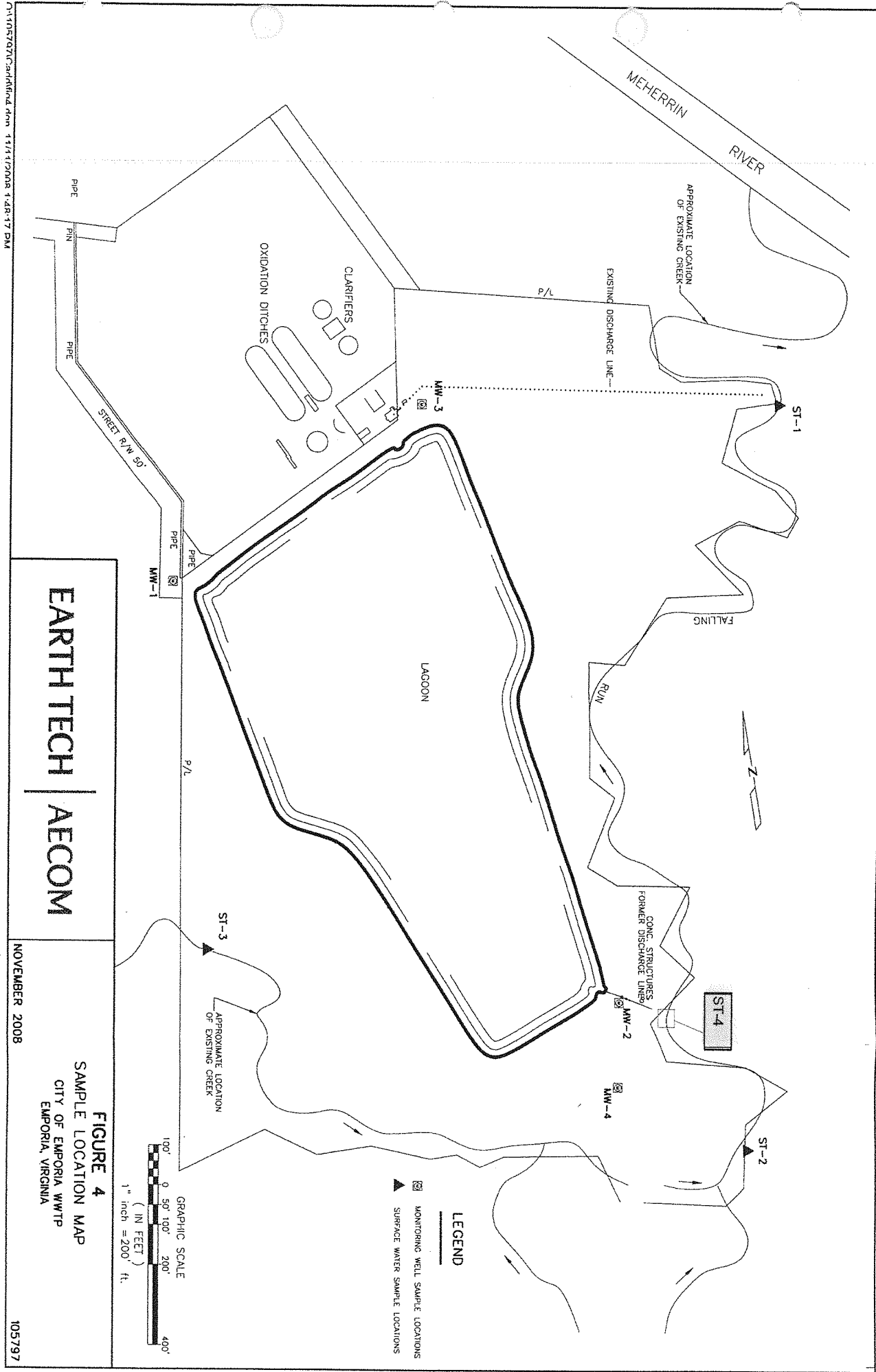


Curtis J. Linderman, P.E.

Water Permit Manager, Department of Environmental Quality

Date:

2/6/09



Attachment L: Whole Effluent Toxicity Memorandum

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY *Piedmont Regional Office*

4949-A Cox Road, Glen Allen, VA 23060-6296

804/527-5020

SUBJECT: Whole Effluent Toxicity (WET) Test Data Review and Permit Language:
Emporia WWTP, VPDES VA0020346

TO: Deborah DeBiasi, CO- WET

FROM: Janine Howard

DATE: 12/5/11, revised 2/13/12, 3/14/12, 3/19/12, and 3/26/12

Facility Name: Emporia WWTP
Permit Number: VA0020346
Receiving Stream: Meherrin River
Facility SIC: 4952
Effluent Design Flow 1.5 MGD
Instream Waste Concentration (IWC): 11%

FACILITY DESCRIPTION

The 2007 permit for this facility expires May 13, 2012 and PRO is in the process of developing the 2012 permit. The City of Emporia Wastewater Treatment Plant is a major municipal facility with a design flow of 1.5 MGD. The facility is located at 500 Tall Oaks Drive in Emporia, Virginia, sits on about 55 acres and is bounded on the south and east by Falling Run Creek, a tributary of the Meherrin River. The facility serves a population of approximately 5,500 persons with 2,500 connections. The WWTP is comprised of a 22-acre sludge lagoon, a clarifier and secondary clarifier, oxidation ditches, screening and grit removal, and administrative/laboratory buildings. There is one permitted outfall (001) which discharges to the Meherrin River. The 2007 permit contains a Whole Effluent Toxicity (WET) special condition that requires annual chronic toxicity testing.

FACILITY REQUIREMENTS

The 2007 WET special condition requires the following tests to be used: chronic 3-brood static renewal survival and reproduction test using *Ceriodaphnia dubia* and the chronic 7-day static renewal survival and growth test using *Pimephales promelas*. Both testing scenarios required 24-hour flow-proportioned effluent samples collected from Outfall 001. Per the 2007 permit, the test dilutions should be able to determine compliance with a No Observed Effect Concentration (NOEC) of greater than or equal to 8% in all of the tests conducted.

Prior to the 2007, acute toxicity testing had been required for the previous two permit terms and acute toxicity had never been shown by the tests. For this reason, acute toxicity testing requirements were not included in the 2007 permit.

DATA SUMMARY

A review of five sets of the annual testing data, submitted by the facility in 2008, 2009, 2010, and 2011 shows that the toxicity test results were greater than or equal to the WET Program NOEC endpoint of 8% in the 2007 permit (see Tables 1 and 2). All toxicity tests were performed by Biological Monitoring, Inc and no quality control problems were found.

Statistical analysis of the *Pimephales promelas* toxicity data using Stats.exe (attached) showed no limit was necessary. However, statistical analysis of the *Ceriodaphnia dubia* data yielded a toxicity limit based on acute toxicity. The need for a limitation was verified by a second statistical evaluation of an expanded *C. dubia* toxicity data dataset, utilizing historical chronic toxicity data (Table 3). The limit ($TU_a = 1.02$) will be applied as a maximum and a four year schedule of compliance will be afforded. Annual interim monitoring will be required until such time as the limitation becomes effective.

The proposed special condition language for the 2012 permit is included below. Also attached is the WETLIM10 spreadsheet which was used to compute the acute toxicity limit contained in the 2012 permit.

Table 1: Results of Chronic Toxicity Tests *P.promelas*.

TEST PERIOD	TEST DATE	TEST RESULT:	% SURVIVAL IN 100% EFFLUENT (7 day)	TEST Lab
1 st Annual	11/27/07- 12/4/07	NOEC= 100% S,G (TU _c = 1.0)	97.5%	Biological Monitoring Inc.
2 nd Annual	10/28/11- 11/4/08	NOEC= 100% S,G (TU _c = 1.0)	100%	Biological Monitoring Inc.
3 rd Annual	10/20/09- 10/27/09	NOEC= 100% S,G (TU _c = 1.0)	100%	Biological Monitoring Inc.
4 th Annual	10/26/10- 11/2/10	NOEC= 100% S,G (TU _c =1.0)	97.5%	Biological Monitoring Inc.
5 th Annual	10/25/11- 11/1/11	NOEC= 100% S,G (TU _c = 1.0)	95%	Biological Monitoring Inc.

S= survival, G= growth

Table 2: Results of Chronic Toxicity Tests *C. dubia*.

TEST SUBMITTAL PERIOD	TEST DATE	TEST RESULT	% SURVIVAL IN 100% EFFLUENT (7 day)	TEST Lab
1 st Annual	11/27/07- 12/3/07	NOEC= 100% S,R (TU _c = 1.0)	100%	Biological Monitoring Inc.
2 nd Annual	10/28/08- 11/3/08	NOEC= 100% S (TU _c = 1.0) NOEC= 8% R (TU _c = 12.5)	100%	Biological Monitoring Inc.
3 rd Annual	10/20/09- 10/26/09	NOEC= 100% S (TU _c = 1.0) NOEC= 8% R (TU _c = 12.5)	100%	Biological Monitoring Inc.
4 th Annual	10/26/10- 11/2/10	NOEC= 54% S (TU _c = 1.85) NOEC= 8% R (TU _c = 12.5)	50%	Biological Monitoring Inc.
5 th Annual	10/25/11- 10/31/11	NOEC = 100% S (TU _c = 1.0) NOEC = 50% R (TU _c = 2.0)	100%	Biological Monitoring Inc.

S= survival, R = reproduction

Note: The bold NOEC result is the lowest NOEC of the test pair and represents the test endpoint.

Table 3. Historical Chronic Toxicity Test Data for *C. dubia*

TEST DATE	TEST RESULT	% SURVIVAL IN 100% EFFLUENT (6-7 day)	TEST Lab
8/31/99-9/7/99	NOEC= 100% S (TU _c = 1.0) NOEC= 52.5% R (TU _c = 1.9)	50%	Biological Monitoring Inc.
8/15/00- 8/21/00	NOEC= 10.5% S,R (TU _c = 9.5)	0%	Biological Monitoring Inc.
8/28/01-9/4/01	NOEC= 100% S,R (TU _c = 1.0)	90%	Biological Monitoring Inc.
10/22/02- 10/28/02	NOEC= 100% S,R (TU _c = 1.0)	100%	Biological Monitoring Inc.
1/6/04- 1/13/04	NOEC= 100% S,R (TU _c = 1.0)	100%	Biological Monitoring Inc.
9/22/05- 9/29/05	NOEC= 100% S,R (TU _c = 1.0)	80%	Biological Monitoring Inc.
12/7/06- 12/13/06	NOEC= 100% S (TU _c = 1.0) NOEC= 9% R (TU _c = 11.11)	100%	Biological Monitoring Inc.

S= survival, R = reproduction

Note: The bold NOEC result is the lowest NOEC of the test pair and represents the test endpoint.

CONCLUSION & RECOMMENDATIONS

The facility has shown a reasonable potential for toxicity as defined in Part I.D (WET Testing) of the 2007 permit. Based on the statistical evaluation, an acute toxicity limit is included in the 2012 draft permit. A four year schedule of compliance is given for the permittee to come into compliance with the limitation. Draft WET special condition language follows.

D. Whole Effluent Toxicity (WET) Testing

1. The Whole Effluent Toxicity limitation of 1.02 TU_a (LC₅₀=98%) in Part I.A. is effective no later than 4 years following the effective date of the permit as described in the Schedule of Compliance in Part I.D.

2. Commencing no later than three (3) months following the effective date of the limit, the permittee shall conduct quarterly acute toxicity tests using 24-hour flow-proportioned composite samples of final effluent from Outfall 001 in accordance with the schedule in Part I.C.4. The acute tests to use are:

48 Hour Static Acute test using *Ceriodaphnia dubia*

48-Hour Static Acute test using *Pimephales promelas*

These acute tests shall be performed with a minimum of 5 dilutions, derived geometrically, for calculation of a valid LC₅₀ and corresponding acute Toxic Units (TU_a). Express as TU_a (Acute Toxic Units) by dividing 100/LC₅₀ for DMR reporting. Two copies of the toxicity test results shall be submitted with the DMR. Test procedures and reporting shall be in accordance with the WET testing methods cited in 40 CFR 136.3.

3. The permit may be modified or revoked and reissued to include pollutant specific limits in lieu of a WET limit should it be demonstrated that toxicity is due to specific parameters. The pollutant specific limits must control the toxicity of the effluent.

4. Reporting Schedule

The permittee shall submit the toxicity test reports with the DMR for the tests specified in accordance with the following schedule:

Period	Compliance Period*	DMR/Report Due Date
1 st Quarter	Jun-Aug 2016	10 th of the month immediately following each compliance period.
2 nd Quarter	Sep-Nov 2016	
3 rd Quarter	Dec-Feb 2017	
4 th Quarter	Mar-May 2017	

*Note: dates in permit may differ slightly depending on the date of reissuance and the effective date of the permit.

VA0020346 Emporia WWTP Toxicity Stats Results

Facility = Emporia WWTP
Chemical = **Toxicity C. dubia** (including historical data)
Chronic averaging period = 4
WLAa = 10.2
WLAc = 9
Q.L. = 1
samples/mo. = 1
samples/wk. = 1

Summary of Statistics:

observations = 12
Expected Value = 6.28188
Variance = 122.731
C.V. = 1.763553
97th percentile daily values = 28.9983
97th percentile 4 day average = 19.6224
97th percentile 30 day average = 10.0864
< Q.L. = 0
Model used = lognormal

A limit is needed based on Acute Toxicity
Maximum Daily Limit = 10.2
Average Weekly limit = 10.2
Average Monthly Limit = 10.2

The data are:

1
12.5
12.5
12.5
2
1.9
9.5
1
1
1
1
11.11

Facility = Emporia WWTP
Chemical = **Toxicity C. dubia** (2007 permit data only)
Chronic averaging period = 4
WLAa = 10.2
WLAc = 9
Q.L. = 1
samples/mo. = 1
samples/wk. = 1

Summary of Statistics:

observations = 5
Expected Value = 8.1
Variance = 23.6196
C.V. = 0.6
97th percentile daily values = 19.7106
97th percentile 4 day average = 13.4767
97th percentile 30 day average = 9.76903
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Acute Toxicity
Maximum Daily Limit = 10.2
Average Weekly limit = 10.2
Average Monthly Limit = 10.2

The data are:

1
12.5
12.5
12.5
2

Facility = Emporia WWTP
Chemical = **Toxicity P.promelas**
Chronic averaging period = 4
WLAa = 10.24
WLAc = 9
Q.L. = 1
samples/mo. = 1
samples/wk. = 1

Summary of Statistics:

observations = 4
Expected Value = 1
Variance = .36
C.V. = 0.6
97th percentile daily values = 2.43341
97th percentile 4 day average = 1.66379
97th percentile 30 day average= 1.20605
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

1
1
1
1



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
1	Spreadsheet for determination of WET test endpoints or WET limits															
2																
3																
4	Excel 97				Acute Endpoint/Permit Limit		Use as LC₅₀ in Special Condition, as TUA on DMR									
5	Revision Date: 01/10/05															
6	File: WETLIM10.xls				ACUTE 1.024514025 TUA		LC₅₀ =		98 %		Use as		1.02		TUA	
7	(MIX.EXE required also)				ACUTE WLAa		1.024514		Note: Inform the permittee that if the mean of the data exceeds this TUA: 1.0 a limit may result using WLA.EXE							
8																
9																
10																
11					Chronic Endpoint/Permit Limit		Use as NOEC in Special Condition, as TUC on DMR									
12																
13																
14																
15	Enter data in the cells with blue type:				CHRONIC 10.24514025 TUC		NOEC =		10 %		Use as		10.00		TUC	
16																
17	Entry Date: 02/13/12				CHRONIC WLAa,c		10.24514		Note: Inform the permittee that if the mean of the data exceeds this TUC: 4.21018579							
18	Facility Name: Emporia WWTP				CHRONIC WLAc		9									
19	VPDES Number: VA0020346				* Both means acute expressed as chronic											
20	Outfall Number: 1															
21																
22	Plant Flow: 1.5 MGD				% Flow to be used from MIX.EXE					Difuser /modeling study?						
23	Acute 1Q10: 4.9 MGD				73.93 %					Enter Y/N N						
24	Chronic 7Q10: 12 MGD				100 %					Acute 1 : 1						
25																
26	Are data available to calculate CV? (Y/N)				N		(Minimum of 10 data points, same species, needed)					Go to Page 2				
27	Are data available to calculate ACR? (Y/N)				N		(NOEC<LC50, do not use greater/less than data)					Go to Page 3				
28																
29																
30	IWC _a		29.28217672 %		Plant flow/plant flow + 1Q10		NOTE: If the IWC_a is >33%, specify the NOAEC = 100% test/endpoint for use									
31	IWC _c		11.11111111 %		Plant flow/plant flow + 7Q10											
32																
33	Dilution, acute		3.415046667		100/IWC _a											
34	Dilution, chronic		9		100/IWC _c											
35																
36	WLA _a		1.024514		Instream criterion (0.3 TUA) X's Dilution, acute											
37	WLA _c		9		Instream criterion (1.0 TUC) X's Dilution, chronic											
38	WLA _{a,c}		10.24514		ACR X's WLA _a - converts acute WLA to chronic units											
39																
40	ACR -acute/chronic ratio		10		LC50/NOEC (Default is 10 - if data are available, use tables Page 3)											
41	CV-Coefficient of variation		0.6		Default of 0.6 - if data are available, use tables Page 2)											
42	Constants eA		0.4109447		Default = 0.41											
43	eB		0.6010373		Default = 0.60											
44	eC		2.4334175		Default = 2.43											
45	eD		2.4334175		Default = 2.43 (1 samp)											
46																
47	LTA _{a,c}		4.210185984		WLAa,c X's eA		**The Maximum Daily Limit is calculated from the lowest LTA, X's eC. The LTAa,c and MDL using it are driven by the ACR.									
48	LTA _c		5.4093357		WLAc X's eB											
49	MDL** with LTA _{a,c}		10.24514025		TUC		NOEC =		9.760725		(Protects from acute/chronic toxicity)		Rounded NOEC's		% 10	
50	MDL** with LTA _c		13.16317216		TUC		NOEC =		7.596953		(Protects from chronic toxicity)		NOEC =		% 8	
51	AML with lowest LTA		10.24514025		TUC		NOEC =		9.760725		Lowest LTA X's eD		NOEC =		% 10	
52																
53	IF ONLY ACUTE ENDPOINT/LIMIT IS NEEDED, CONVERT MDL FROM TUC to TUA															
54																
55	MDL with LTA _{a,c}		1.024514025		TUA		LC50 =		97.607253		% 98		Rounded LC50's		% 76	
56	MDL with LTA _c		1.316317216		TUA		LC50 =		75.969530		% 76					
57																
58																

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
59																
60	Page 2 - Follow the directions to develop a site specific CV (coefficient of variation)															
61																
62	<p>IF YOU HAVE AT LEAST 10 DATA POINTS THAT ARE QUANTIFIABLE (NOT "<" OR ">") FOR A SPECIES, ENTER THE DATA IN EITHER COLUMN "G" (VERTEBRATE) OR COLUMN "J" (INVERTEBRATE). THE 'CV' WILL BE PICKED UP FOR THE CALCULATIONS BELOW. THE DEFAULT VALUES FOR eA, eB, AND eC WILL CHANGE IF THE 'CV' IS ANYTHING OTHER THAN 0.6.</p>						Vertebrate		Invertebrate							
63							IC ₂₅ Data		IC ₂₅ Data							
64							or		or							
65							LC ₅₀ Data		LC ₅₀ Data							
66							*****		*****							
67							LN of data		LN of data							
68							1		1	0						
69							2		2							
70							3		3							
71							4		4							
72							5		5							
73							6		6							
74							7		7							
75	Coefficient of Variation for effluent tests						8		8							
76	CV = 0.6 (Default 0.6)						9		9							
77							10		10							
78							11		11							
79	σ ² = 0.3074847						12		12							
80	σ = 0.554513029						13		13							
81	Using the log variance to develop eA						14		14							
82	(P. 100, step 2a of TSD)						15		15							
83	Z = 1.881 (97% probability stat from table)						16		16							
84	A = -0.88929666						17		17							
85	eA = 0.410944686						18		18							
86							19		19							
87							20		20							
88	Using the log variance to develop eB						St Dev		NEED DATA		St Dev		NEED DATA		NEED DATA	
89	(P. 100, step 2b of TSD)						Mean		0		Mean		0		0	
90	σ _n ² = 0.086177696						Variance		0		Variance		0		0.000000	
91	B = -0.50909823						CV		0		CV		0			
92	eB = 0.601037335															
93																
94	Using the log variance to develop eC															
95	(P. 100, step 4a of TSD)															
96																
97	σ ² = 0.3074847															
98	σ = 0.554513029															
99	C = 0.889296658															
100	eC = 2.433417525															
101																
102	Using the log variance to develop eD															
103	(P. 100, step 4b of TSD)															
104	n = 1 This number will most likely stay as "1", for 1 sample/month.															
105	σ _n ² = 0.3074847															
106	σ _n = 0.554513029															
107	D = 0.889296658															
108	eD = 2.433417525															
109																



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
110															
111	Page 3 - Follow directions to develop a site specific ACR (Acute to Chronic Ratio)														
112															
113	To determine Acute/Chronic Ratio (ACR), insert usable data below. Usable data is defined as valid paired test results,														
114	acute and chronic, tested at the same temperature, same species. The chronic NOEC must be less than the acute														
115	LC ₅₀ , since the ACR divides the LC ₅₀ by the NOEC. LC ₅₀ 's >100% should not be used.														
116															
117	Table 1. ACR using Vertebrate data														
118															
119															
120	Set #	LC₅₀	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use							
121	1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA							
122	2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA							
123	3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA							
124	4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA							
125	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA							
126	6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA							
127	7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA							
128	8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA							
129	9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA							
130	10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA							
131															
132	ACR for vertebrate data:								0						
133															
134	Table 1. Result:				Vertebrate ACR				0						
135	Table 2. Result:				Invertebrate ACR				0						
136					Lowest ACR				Default to 10						
137															
138	Table 2. ACR using Invertebrate data														
139															
140															
141	Set #	LC₅₀	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use							
142	1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA							
143	2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA							
144	3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA							
145	4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA							
146	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA							
147	6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA							
148	7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA							
149	8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA							
150	9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA							
151	10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA							
152															
153	ACR for vertebrate data:								0						
154															
155															
156															
157	DILUTION SERIES TO RECOMMEND														
158	Table 4.				Monitoring		Limit								
159					% Effluent		TUc								
160	Dilution series based on data mean				23.8		4.210186								
161	Dilution series to use for limit				10		10								
162	Dilution factor to recommend:				0.4873594		0.3162278								
163															
164	Dilution series to recommend:				100.0		1.00								
165					48.7		2.05								
166					23.8		4.21								
167					11.6		8.64								
168					5.64		17.73								
169	Extra dilutions if needed				2.75		36.37								
170					1.34		74.63								
171															
172															

Convert LC₅₀'s and NOEC's to Chronic TU's			
for use in WLA.EXE			
ACR used: 10			
Table 3.	Enter LC₅₀	TUc	Enter NOEC
1		NO DATA	NO DATA
2		NO DATA	NO DATA
3		NO DATA	NO DATA
4		NO DATA	NO DATA
5		NO DATA	NO DATA
6		NO DATA	NO DATA
7		NO DATA	NO DATA
8		NO DATA	NO DATA
9		NO DATA	NO DATA
10		NO DATA	NO DATA
11		NO DATA	NO DATA
12		NO DATA	NO DATA
13		NO DATA	NO DATA
14		NO DATA	NO DATA
15		NO DATA	NO DATA
16		NO DATA	NO DATA
17		NO DATA	NO DATA
18		NO DATA	NO DATA
19		NO DATA	NO DATA
20		NO DATA	NO DATA

If WLA.EXE determines that an acute limit is needed, you need to convert the TUc answer you get to TUa and then an LC50,
enter it here: 10.245 97.61 %LC₅₀
1.0245 TUa

Cell: I9
Comment: This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: K18
Comment: This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: J22
Comment: Remember to change the "N" to "Y" if you have ratios entered, otherwise, they won't be used in the calculations.

Cell: C40
Comment: If you have entered data to calculate an ACR on page 3, and this is still defaulted to "10", make sure you have selected "Y" in cell E21

Cell: C41
Comment: If you have entered data to calculate an effluent specific CV on page 2, and this is still defaulted to "0.6", make sure you have selected "Y" in cell E20

Cell: L48
Comment: See Row 151 for the appropriate dilution series to use for these NOEC's

Cell: G62
Comment: Vertebrates are:
Pimephales promelas
Oncorhynchus mykiss
Cyprinodon variegatus

Cell: J62
Comment: Invertebrates are:
Ceriodaphnia dubia
Mysidopsis bahia

Cell: C117
Comment: Vertebrates are:
Pimephales promelas
Cyprinodon variegatus

Cell: M119
Comment: The ACR has been picked up from cell C34 on Page 1. If you have paired data to calculate an ACR, enter it in the tables to the left, and make sure you have a "Y" in cell E21 on Page 1. Otherwise, the default of 10 will be used to convert your acute data.

Cell: M121
Comment: If you are only concerned with acute data, you can enter it in the NOEC column for conversion and the number calculated will be equivalent to the TUa. The calculation is the same: $100/\text{NOEC} = \text{TUc}$ or $100/\text{LC50} = \text{TUa}$.

Cell: C138
Comment: Invertebrates are:
Ceriodaphnia dubia
Mysidopsis bahia

Attachment M: No Exposure Certification



COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

PIEDMONT REGIONAL OFFICE

4949-A Cox Road, Glen Allen, Virginia 23060

(804) 527-5020 Fax (804) 527-5106

www.deq.virginia.gov

Douglas W. Domenech
Secretary of Natural Resources

David K. Paylor
Director

Michael P. Murphy
Regional Director

March 16, 2012

Brian Thrower, City Manager
City of Emporia Virginia
201 South Main Stree
Emporia, VA 23847

RE: No Exposure Certification for City of Emporia Wastewater Treatment Facility
500 Tall Oaks, Emporia VA 23847

Dear Applicant:

Please find enclosed a copy of the completed Virginia Department of Environmental Quality (DEQ) No Exposure Certification for Exclusion from Virginia Pollutant Discharge Elimination System (VPDES) Storm Water Permitting in response to your submittal received November 21, 2011. This certification constitutes notice that permit authorization is not required for storm water discharges associated with industrial activity under the VPDES Permit Program due to the existence of a condition of "No Exposure" at the above referenced facility.

In accordance with the VPDES Permit Regulation (9VAC 25-31-120.E), to maintain eligibility for continued exclusion, you must submit a signed certification to DEQ no less frequently than once every five years. Consequently, this Certification is effective through November 20, 2016, provided the condition of no exposure continues to exist at this facility.

Should site conditions change and industrial activities or materials become exposed to precipitation that may result in a storm water discharge to waters of the Commonwealth, authorization under an individual or general VPDES permit may be required.

If you have any questions, please feel free to call Jeremy Kazio at (804) 527-5044 or email at Jeremy.Kazio@deq.virginia.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Curtis J. Linderman".

Curtis J. Linderman, P.E.
Water Permit Manager

Enclosure